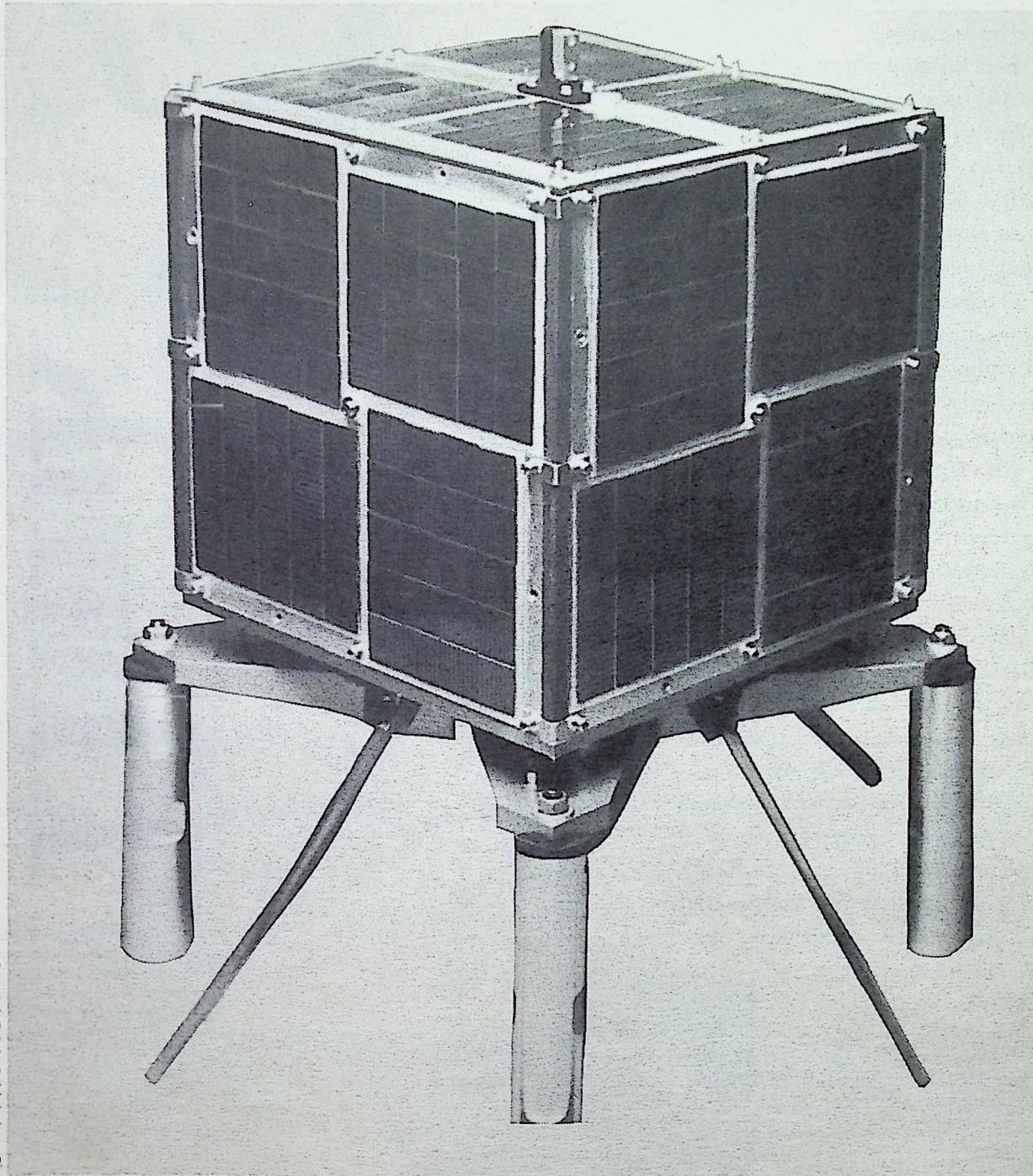


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BOARDWATCH MAGAZINE

ISSN: 0894-5209, Volume IV - Issue 3, March 1990. Boardwatch Magazine is published 12 times per year at an annual subscription rate of \$28 (\$56 foreign). Address corrections or subscription orders may be made by voice telephone at (303)973-6038. The Boardwatch Online Information Service is available at (303)973-4222 (2400 bps) and (303)933-2286 (HST/V.32 9600 bps). Address U.S. Mail correspondence to Boardwatch Magazine, 5970 South Vivian Street, Littleton, CO 80127
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EDITOR'S NOTES

They're dying. They're dying slowly, painfully, and they'll ruin a lot of lives in the process, but they're going the way of the feudal estate, Mongol Hordes, and Egyptian Pharaohs. The large scale corporate entities - IBM, General Electric, General Motors, have seen their finest hour. They're reorganizing internally in a frenzy of desperation, and they're eating each other like sharks via various cannibalistic takeover strategies. But they are dying - at least in their current form.

It is not so much that they can't compete. We've reached the point where they can't even play the game. Most of us remain dazzled by the hordes of capital they control or the security and benefits of their employment packages. But those of us who remain faithful to the paradigm of allegiance to the corporate sugar daddy are emulating the role of the feudal serf faithfully tilling the land for his master after the revolution is already over. It will certainly take a few more years for the notion to become popular, but in our age, it's already a done deal.

This is not solely a function of the information age, the technology revolution, or the invention of silly putty. It is more a change in the attitude of the serfs. We have a nation of people who wander about through their day jobs at XYZ Corporation in a complete zombie-like daze - almost thoroughly unconcerned with the fate of the corporate entity. They've been so thoroughly deluged with memos, policy edicts, corporate mandates, retraining programs, reorganizations, and the deft, sure bungling of the MBA "suits" who have become ubiquitous in corporate management that they have lost all common sense of identity with *The Company*. They've given up on their personal ability to have an impact. At this point, as they shuffle numbly from one cup of coffee to the next, they can barely answer the telephone with the cogent authority required to say hello.

So by day they stumble through the padded cubicles of their "office environments." At a little after 4:00 PM they either sate themselves with cocaine, alcohol, sex, and tv or they go to work on their "project."

The diversity of "the projects" is awe inspiring. Children's books, cartoons, magazine articles, electronic bulletin boards, designs for tools, custom mail order catalogs of the world's greatest coffees and teas. Plug-in circuit cards to connect their PC to a market scale in Botswana. "If we can only calculate the weight of an average African cacao bean sale, we could use it to program elevators in Chicago." Perhaps an occasional orbiting satellite BBS - page 5 this issue.

This is a good area to draw a descriptive study in contrasts. A group of Amateur Radio enthusiasts drew together the material resources and 100,000 plus hours of labor to develop what has to be the most technically elegant launch project done this decade for the bizarre purpose of allowing individuals with personal computers to communicate on a global scale without wires. And they got it launched.

In a single telephone call to AMSAT we had not only complete information on this project within the hour from an extraordinarily knowledgeable, enthusiastic, and eloquent, albeit entirely unpaid, spokesman (Dick Daniels), but a package came two days later with our cover photo and a thoroughly professional package of information. A second telephone call to Andy Freeborn, another "amateur" and we had everything anyone would ever want to know about the history and origin of packet radio. A final phone call to entrepreneur Gwyn Reedy of Florida and we had pricing on a complete package to talk to the satellite for under \$350 - not counting radio. But he apologetically allowed that it could be as long as week before it would actually get to us via UPS - a lot of interest these days you know.

IBM and Motorola also had an announcement. After seven years of development and several hundred million dollars of investment they have an exciting new product titled Ardis - essentially a packet radio package for laptops to allow the ten million outside service

workers to access an online service. Twenty-two telephone calls later we still don't know what the hell they are talking about. And there are at least twenty-three of us in that situation.

We spoke, usually briefly, with twenty-two of the dullest, most dim witted individuals still capable of wearing clothes. Not one had the slightest bit of useful information on Ardis and not one showed the slightest interest in the project. And we weren't blindly dialing through the company phone book - these were the people involved with the project! In fairness, we often didn't get to speak with who we called at all. Instead, we talked to a Babe-On-Phone (BOP) who's sole role in the corporate hierarchy was to take names and telephone numbers, promise to have Mr. Big return the call, and then file the information in the circular file. They did have a press release in an \$8 plastic folder they could send. We've always found those terribly informative.

It was a good exercise. A visit to the land of the pathetically brain dead revitalizes our enthusiasm for the amazing diversity, creativity, and pure mental horsepower of the small-time cottage industry individuals we so pleasurable talk to day in and day out. And we have to wonder how many of these para-humans at Motorola by day actually have thoroughly fascinating "projects" in progress after 4:00 PM. Oh Eleanor Rigby. This concept of leaving your brain in a jar by the door is an odd one though isn't it.

We suspect that it has always been so, just not so much so. We were surprised to learn that of the three major household appliance manufacturers, not one has ever invented and successfully brought to market one single solitary new appliance. Every innovation in household appliances has come from out of house - individual inventors. The companies either buy the rights, or sadly in many cases, steal them. An army of lawyers then manage a decade long delay of whatever feeble legal attempts the wronged inventor may be able to mount - until the product either dies in the market place after the quick money is made, or if successful, a "settlement" is reached with the long desperate inventor.

From electricity, the telephone, the television, the radio, pocket calculators, automobiles, rocketry, to the personal computer itself, all traceable to a lone inventor - usually nearly broke, disheartened, and ridiculed by the time the breakthrough occurred. Ten years of gruesome work and they were suddenly overnight success stories. The only corporate invention of success that comes to mind involves little yellow sticky note things and I understand it was actually invented by a guy who had to clandestinely turn it into a top seller on his own out of his basement before 3M would back it. Apple Computer was actually born of stolen Hewlett Packard chips because the Woz couldn't get anyone at HP interested in his toy computer.

On the other hand, the local bell operating companies are continually frustrated that they seem unable to play in the data communications game. The latest ploy, attack the BBS operators. Their gateways are NOT making the trip. Southwestern Bell is failing miserably with Sourceline and their current strategy is to send the bill to the hobby BBS system operators. This goes beyond the bounds of intellectually crippled, it qualifies as morally pathetic as well.

IBM/Sears Prodigy is only modestly limp by comparison - but even with ANOTHER billion down that rat hole it's not going to happen. If you buy a GM Corporation automobile over the current Japanese and German offerings at this point you have more dollars than sense. In 1990, we find the American automobile industry frantically trying to invent the 1975 Toyota. In truth IBM has been chasing the PC technology all along - they haven't led anything. And the premium you must pay for their higher quality molded plastic packaging just doesn't work out in a fiscal sense.

The result is that a lot of these little evening projects are turning into careers. We simply did not believe the 25 million figure for people working at home. We do now but the latest figures are 30 million. Could it be? They may be working somewhere else by day but clearly over a quarter of the work force is abandoning corporate America (or is it the other way around?) to pursue their own entrepreneurial interests.

What finally brought this into focus was three conversations we had this week with three entirely different individuals. The particulars are not unimportant - and you may read about them in future issues of Boardwatch. But for now, it is sufficient to say that all three avowed that they had real day jobs that they would never leave of course and they apologized profusely for even thinking that what they were doing vis a vis their "projects" could ever amount to anything more than a hobby. In fact all avowed that their pet projects amounted to nothing really.

In reality, their day jobs amount to nothing. You couldn't begin to tell what their role in life was from their job title much less what it is they actually did for these corporations by day. The "nothing" hobby projects were all fascinating, if perhaps a bit embryonic at this point. All were visionary, a bit techie, and with an end goal of making life on the ball of dirty water a bit better in ways large or small.

Cease the apologetics. Get on with the real work of America - basement innovation. And if you are among those that continue to hitch your wagon to the corporate star, wake up while you still have clothes.

Jack Rickard
Editor

While most online service aficionados think of bulletin boards as inherently tied to the telephone lines, a widening group of amateur radio enthusiasts reject that thinking pretty much out of hand. The Tucson Amateur Radio group was experimenting with a concept termed "packet radio" as early as 1981. In 1985, they released their new TNC2 packet radio device. It has grown into a communications medium in its own right and the HAM's are curiously unconcerned with local telephone installation fees, long distance rates, and telephone credit cards.

To become involved with the HAM packet radio world, you first need an amateur radio license issued by the Federal Communications Commission. And note that no commercial use of the amateur frequency bands is allowed. One of the license requirements is for the operator to become proficient in the use of Morse code for communications. Although Morse code is almost comically obsolete and used for very little in the modern world, it has been retained as a requirement and many who would like to become involved in the HAM world are essentially unable to until they spend a few months practicing Morse code. The FCC is currently considering a proposal for dropping the code requirement, but at this point it works effectively to restrict the number of operators on the air.

Essentially, packet radio works quite similarly to conventional packet switched telephone networks. In fact, the X.25 recommendation used by packet switching networks has an associated AX.25 specification for radio. The AX.25 specification is quite similar to the standard X.25 used on the telephone lines but has a dramatically expanded addressing block to contain HAM call sign characters and allow for several repetitions of the address.

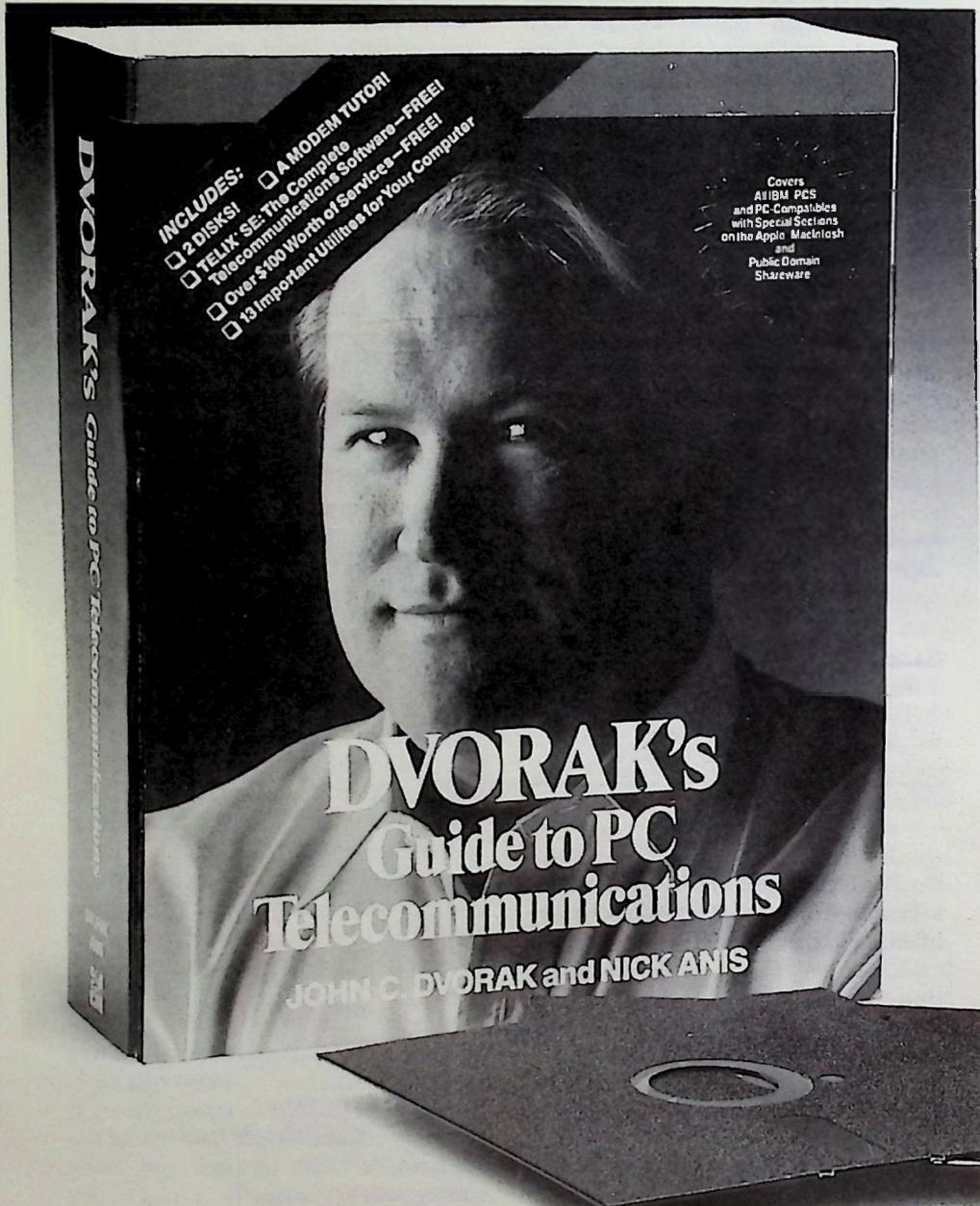
Data is transmitted in blocks or "packets" that are individually addressed to a destination receiver by radio call sign. If a block is garbled in transmission, it is simply retransmitted. Because of the vagaries of radio transmission, such connections are normally limited to 300 or 1200 bps although some equipment is now becoming available that allows

ORBITING BBS SATELLITES

On Sunday evening, January 21, 1990, a French Arianespace Ariane 4 rocket lifted off from Kourou, French Guiana - the former French penal colony and setting for the movie Papillon. The spacecraft's primary mission was to launch the French SPOT 2 terrestrial observation satellite. Its secondary mission was to test ASAP, a program for launching small auxiliary payloads. On this launch, four tiny MICROSAT units developed by Radio Amateurs were on board. And therein lies a tale - involving orbital bulletin board systems.

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transmission as high as 9600 bps and HAMS are experimenting with 56 kbps transmissions.

Rather than the conventional Packet Assembler/Disassembler (PAD) used by the telephone-tied packet nets, packet radio uses a Terminal Node Controller (TNC) that essentially performs the same function, as well as acting as the modem. So to go "on air" via packet radio, you need the TNC, a radio transceiver and antenna capable of transmitting and receiving HAM frequencies, a computer with serial port, and an ordinary terminal software program such as Procomm.

A few packet-radio buffs assemble tiny, hand-held portable TNC/radio combinations for use with their laptop computer. A second TNC/radio unit at home is tied to a conventional modem and telephone connection. In this way, the roving laptop can not only connect to other packet radio systems, but also connect to the home unit to dial out on conventional telephone lines. In this way, the HAMS work out their own low cost version of the cellular telephone system.

Packet is used for point-to-point communications much as voice radios are. But many HAMS operate what are essentially on-air bulletin boards as well. Their unit has more advanced BBS software in place of Procomm. Many systems also relay messages to other systems. Packet radio uses the VHF and UHF frequency bands. They are essentially limited to line of sight. To cover long distances requires the use of relay stations. While any packet radio rig can act as a relay station, truly global communications can be a bit problematical.

About two years ago, a few members of AMSAT-NA, the Amateur Radio Satellite group of North America, were meeting in Washington D.C. at an Amateur Radio conference. A few of the attendees went out to dinner and the conversation turned to satellites as a means of extending the range of packet radio. The discussion turned to the concept of producing extremely small, simple, store and forward packet radio sat-

ellites. Fortunately, a paper table napkin, the one indispensable requisite for any true success story, was available for the required sketch. The MICROSAT was born.

HAM interest in satellites actually goes back some time. The first Orbiting Satellite Carrying Amateur Radio (OSCAR) was launched December 12, 1961 - just four years after Sputnik 1. It was a very simple device that acted as a radio beacon transmitting a message for just a few weeks before failing. Since 1969, AMSAT groups have developed and launched OSCARs 5 through 13.

Radio Amateurs remain as one of the last bastions of a once popular concept involving volunteer activity united toward a common goal. The MICROSATs were built entirely from parts donated by radio amateurs and interested corporations. Martin Marietta donated a week's test time in their thermal vacuum chamber. Quadron donated a multitasking operating system. Even Stanley Tool Company donated a 1000-ft roll of the blade material used in their carpenter tape measures for use as antennas.

Dave Crowdin, Launch Operations Manager for the AMSAT-NA project, estimates total parts value at \$65,000. Additionally, over 100,000 hours of volunteer labor went into the PACSAT satellite. The resulting device is a marvel of simplicity and miniaturization. AMSAT-NA, BRAMSAT (AMSAT Brazil), AMSAT ARGENTINA, and the Weber State College Center for Aerospace Technology set up a small laboratory outside of Boulder Colorado in March 1989 to assemble the MICROSATs.

The January 21 Ariane launch actually carried six satellites in addition to its main SPOT 2 cargo. Two were UOSSATs from the University of Surrey in England. The remaining four satellites were OSCARs 16 through 19. Dave Cowdin, a Martin Marietta employee from Littleton Colorado actually went to Kourou to attend the launch at his own expense as the Launch Operations Manager. Unfortunately, the

launch, originally scheduled for January 4, was delayed by various weather conditions and other difficulties until January 21. Crowdin, using his own vacation time from his job at Martin Marietta, was on location from December 16 to January 24th. By Tuesday, reports were flooding in of very strong clear signals from all the MINISATs.

The four OSCAR satellites are engineering marvels in their own right. The units weigh a scant 22 pounds and are essentially 9-inch cubes of tightly packed electronics. The unit consists of five modules: power, transmitter, receiver, computer, and a fifth for various experiments. The surface of the cube is covered with solar cells used to charge nickel-cadmium batteries in the power module. The WEBERSAT is slightly larger with an additionally module for its imaging equipment.

The computer module contains a highly miniaturized computer that is essentially equivalent to an AT class IBM compatible unit with 8 MB of RAM. It uses a NEC V40 microprocessor - an NEC equivalent of the Intel 80186. The receiver monitors five separate channels. The S-Band (70 centimeter) transmitter is capable of up to 4 watts of power on two channels. Although this is less power than that required to light a small Christmas tree light bulb, it is considered quite high power by satellite standards. While many satellites require elaborate directional dish antennas to track them, these units can be received with a very simple quarter-wave dipole antenna hung out the window (very nearly a coat hanger).

In addition to their very small size, the satellites are marvels of cost and efficiency in other ways as well. The antennas, for example, are made from ordinary metal tape measure blades used by carpenters. The satellites have no powered maneuvering capability in the conventional sense - they are oriented using an ingenious system operating from sunlight and the earth's own magnetic field. Bar magnets are positioned vertically along the Z axis of the satellite and the earth's field causes the satellite to

remain upright much as it makes the needle in a pocket compass align with the north pole.

One side of each of the carpenter tape measure blades is polished to a reflective silver finish while the other side is painted black. As a result, one side reflects sunlight while the other absorbs it. The photon pressure on the reflective side causes the satellite to rotate. Photons striking the black surface are simply absorbed as heat. This differential induces enough torque to slowly spin the satellite so that the radiant energy of the sun is applied evenly to the unit - preventing one side from baking and the other freezing.

This sun driven rotation would gradually increase in speed almost infinitely. But this too is ingeniously regulated by the bar magnets. As the pressure of sunlight causes the satellite to increase rotational speed, the movement of the bar magnets within the earth's field acts very much like an ordinary generator. This creates a counter force that increases as the speed of the rotation increases. At a rate of about 1 revolution per hour, the satellite rotation reaches an equilibrium point.

The result of these three entirely passive, simple, failure-proof methods is a satellite oriented vertically upright and spinning in a slow, controlled, rotation.

The satellites were launched into a sun-synchronous orbit. Essentially, this means they pass over the earth in orbit rather than hanging in geostationary orbit over a single point. Further, they pass overhead four times daily to provide coverage of both northern and southern hemispheres. Two passes daily provide optimum conditions for each hemisphere - nominally at 1:00 AM and 1:00 PM daily. The fly-by lasts just about 15 minutes.

OSCAR 17 is referred to as DOVE - Digital Orbiting Voice Encoder. It was sponsored by the Brazil amateur radio operators and Dr. Junior Torez de Castro PY2BJO of Sao Paulo, Brazil. DOVE is intended to promote goodwill through communication. It contains a

Vortrax digital voice synthesis unit broadcasting on the 2 meter amateur radio band. This allows operators to upload messages in digital data form and the satellite will then broadcast voice messages. The concept is for school children to submit peace messages and so forth for transmission. The unit will also announce what is normally carried as digital telemetry data in a digitized voice. "My skin temperature is X. I'm currently located over latitude x and longitude y".

Because the satellite passes in a Low Earth Orbit (about 500 miles up) and transmits in voice form on the very common 2 meter band at high power, DOVE can be heard using the most rudimentary radio equipment.

WEBERSAT (OSCAR 18) is sponsored by Weber State University of Ogden Utah. This fascinating unit contains a small color Charge Coupled Device (CCD) TV camera head aimed at the earth. The satellite will transmit 700 X 400 pixel color digitized earth images at 1200 bps. The unit also contains a packet store and forward system and various spectrometers to measure visual light, magnetic flux, micrometeorite impacts, temperatures, and voltages. HAMS may download and view these graphics images using software available from AMSAT-NA. Additionally, they may transmit and receive photos using the store and forward function.

LUSAT, also known as OSCAR 19 is sponsored by the Argentine amateur radio operators whose call letters are always prefaced with LU - thus the name. It too will operate as an orbiting packet store and forward message system - essentially a BBS, at 70 centimeters (437 MHz). It will also carry a small Continuous Wave (CW) transmitter for Morse code beacon transmissions.

OSCAR 16 is also known as PACSAT and is essentially the American HAM BBS system sponsored by AMSAT-NA. It supports four two-meter receive channels operating at around the 145 MHz frequency and transmit channels of 70 centimeters (437 MHz). The unit

acts as a packet radio bulletin board system. It contains some text files about the satellite and its purpose and use.

The unique feature of the orbiting OSCAR bulletin board systems is that you may address a message to another HAM packet-radio operator and uplink it to OSCAR during one of the twice daily optimal fly-bys. When the satellite passes over your addressee's location, they may also contact the satellite to upload and download messages. In this way, you can exchange message traffic by packet radio with any other HAM packet radio operator in the world at no cost whatsoever.

The message is delayed only by the time offset between your location and his. Messages are queued into the 8 MB on-board memory and remain there until incoming messages force them off the end of the plank so to speak. In this way, OSCAR acts as an orbiting relay station and bulletin board.

Accessing the OSCARs does require some equipment beyond ordinary packet radio requirements. While the two-meter radio will do for transmitting information to the satellites at around 145 MHz, you will need a different radio for listening to it. This radio is essentially a Single Side Band (SSB) High Frequency (HF) Frequency Modulated (FM) unit capable of receiving 70 centimeter (437 MHz) transmissions. Actually this isn't as difficult as it sounds. Many HAM rigs are multimode radios that can handle both transmit and receive quite easily and there are down converters available for those who don't have 70 cm coverage.

The Terminal Node Controller (TNC) performs the packetization and addressing required under the AX.25 packet radio recommendation. It also includes an internal Audio Frequency Shift Keying (AFSK) modem. The TNC 1 was originally developed by the Tucson Amateur Packet Radio Corporation (TAPR) in 1982. According to TAPR president Andy Freeborn, TAPR designed the TNC 1 and beta tested it at 174 sites. They sold the unit in kit form and licensed it to manufacturers. The TNC 2 was developed in August 1985 and provided operation up to 9600 bps

in a much smaller package. TAPR itself is a non-profit organization of radio amateurs.

Although ordinary TNCs contain an AFSK modem, to talk to the satellites you will need a bit different modem. OSCAR uses a Phase Shift Keying (PSK) modulation technique that provides a bit better noise resistance than AFSK. You will have to buy a separate PSK modem that simply attaches to your TNC with a couple of cables. The Tucson Amateur Packet Radio Corporation sells a PSK modem kit containing three circuit cards, components, and instructions for assembly for \$110. Contact Andy Freeborn NOCCZ, Tucson Amateur Packet Radio Corporation, 5222 Borrego Drive, Colorado Springs, CO 80918: (719)598-8373.

If you are not interested in putting together kits, Gwyn Reedy of Tampa operates a small business titled PacComm that sells ready-made packet radio equipment. He sells a very simple little terminal node controller titled the TINY II for a very reasonable \$119.95. Additionally, he offers about the only assembled and ready to use PSK modem available for \$219.95. If you already have a computer, HAM license, and a multimode radio, the TINY II and the PSK 1 will get you hooked up to both ordinary packet radio and OSCAR for about \$340 total. Contact Gwyn Reedy, PacComm, 3652 West Cypress St., Tampa, FL 33607; (813)874-2980.

Mr. Reedy also operates a bulletin board system that provides information on an entire line of packet radio equipment for both HAMs and commercial use at (813)874-3078. The system currently uses Fido software but he plans to change to a system designed by Brian Riley of Vermont that will allow both packet radio and telephone connects on the same board.

What's next? Phase IV. AMSAT-NA is already at work on a geostationary packet radio satellite. Rather than passing overhead at a 500 mile altitude several times daily, this unit will hang in

place 23,000 miles up allowing 24 hour continuous access within a hemisphere.

Dr. Jeff Wallach of Carrollton Texas operates an electronic bulletin board system dedicated to Satellite Imaging and AMSAT-NA activities at (214)394-7438.

Additionally, AMSAT-NA sponsors a weekly radio net gathering to provide the latest news of the Amateur Space program each Tuesday evening on 3840 KHz. East coast net meets at 2100 EST, Mid America Net meets at 2100 CST while Pacific net begins at 2000 PST. On Sunday, AMSAT-NA nets convene at 1900 Universal Coordinated Time (Greenwich) on 14.282 and 21.280 MHz. For more information on the OSCAR MiniSATS, we found Dick Daniels of AMSAT-NA enormously knowledgeable. He can be reached c/o AMSAT-NA, P.O. Box 27, Washington, DC 20044; (301)589-6062.

TELEBITS

HAYES ANNOUNCES ISDN PC ADAPTER

Hayes Microcomputer Products, Inc. has announced the availability of their Integrated Services Digital Network (ISDN) terminal adapter for IBM PC and compatible computers. The company also announced a support program for application software developers who wish to create software for ISDN applications.

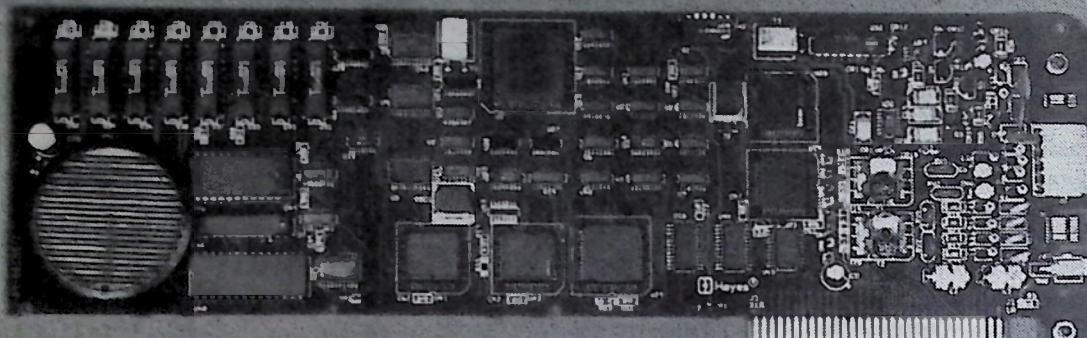
ISDN is a new telephone service that up to this point has existed more in the minds of the telecommunications intelligentsia than in actual practice. Some have insisted that ISDN actually stands for I Still Don't kNow what it's good for. In concept ISDN offers advanced digital features over the existing telephone network. One of its primary features is that it uses existing copper wiring - no new lines or fiber need be installed.

The service comes in two flavors referred to as Primary Rate and Basic Rate. Primary Rate ISDN consists of 23 separate Bearer or B channels capable of carrying digital data at a 64 kilobit-per-second (kbps - 1000 bits per second) and a single supervisor data or D channel - also at the 64 kbps rate - all on a single four wire telephone line. Primary rate is primarily targeted at businesses.

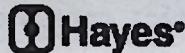
Basic Rate interface consists of two 64 kbps B channels and a single 16 kbps D channel and is aimed primarily at the residential and small business market. It is usually referred to as 2B+D. The original theory was that basic rate ISDN could be offered at 1.5 times the current charge for a residential telephone line. Whether or not that comes to pass is anyone's guess. Our experience observing the local telephone companies would indicate that in actual installations, they will want a great deal more than that but we can hope.

ISDN offers a number of attractive features. For one, on a single line you can make two simultaneous calls - one per B channel - to two different people. But the D channel allows a number of advanced features including conference calls, call transfer, call hold, call retrieve, speed calling, call park, call pickup, and most alluringly, incoming call line identification. The feature most often cited is this incoming CLI which will provide you with the telephone number of the person calling you.

For the online world, ISDN offers a quantum leap in data communications speeds. A single 64 kbps bearer channel can in theory offer file transfers at 64 kbps without any data compression at all. Currently, the highest speed modems commonly available offer 14.4 kbps connect rates. By way of comparison, a 2400 bps modem can transfer a 500 KB file in 36 minutes and 24 seconds. The still pricey 14.4 kbps modems could transfer that same file in six minutes and four seconds. Using ISDN at a 64 kbps rate, it would make the trip in one minute and 22 seconds. With a little data compression, and an application that uses both B channels in



Hayes® ISDN PC Adapter



Hayes Microcomputer Products, Inc. (404) 449-8791

tandem perhaps, this could be reduced even further to essentially a fifteen or twenty second operation.

Detractors of ISDN point out that Local Area Networks typically transmit data at 2 or even 10 Mbps and that ISDN at 64 kbps is essentially obsolete before its even installed. These people are typically better at math than they are at data communications. LANs feature a common bus on which a number of devices communicate - often all at once. LAN protocols operate on the principle that if every device on the LAN talks fast enough, no one will notice that in all the data collisions and contention for band width the actual throughput is a fraction of the rated speed. ISDN allows two distinct buses with one device on each end. One of the primary uses of ISDN envisioned, in fact, is to bridge two local area networks geographically separated - across town or across the country.

The actual physical implementation of ISDN is not as far off as it might appear. To install ISDN, the telephone company must install a digital switch - the device that connects calls. Two types of switches are currently available, the Northern Telecom DMS-100 and the AT&T model 5ESS. Surprisingly, installation of these switches is quite well along in major metropolitan areas. They allow more efficient switching of normal analog telephone calls and advanced features such as call waiting, call forwarding, etc. To switch a line to ISDN is largely a matter of installing different software in the switch and removing some loading coils from the analog line. These loading coils are actually the primary problem with transmitting digital data.

At the user end, ISDN requires some fairly potent equipment generally referred to as a terminal adapter or TA. Ordinary analog telephones are largely useless on an ISDN line and so far ISDN telephone sets are prohibitively

expensive - they are only manufactured by the handful at this point. And internal house or business wiring must be slightly modified. Your current wiring provides four lines but only two are used for telephone communications. ISDN requires use of all four lines. The line must also be terminated in an RJ-45 modular connector rather than the standard RJ-11 modular connector used by your current telephone. You won't have to actually rewire, but you will have to change the jack.

The Hayes product offers the most rational terminal adapter we've seen available. Physically, it consists of a full length plug in circuit card for the standard IBM PC compatible bus. The device will work with the ISDN 2B+D basic rate interface and can be used with either the DMS-100 or the 5ESS switch. The card provides a standard RJ-11 telephone jack where you plug in an ordinary telephone to use the ISDN lines for voice communications. An external power supply allows you to use

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the voice telephone when the PC is turned off. Up to three analog telephone devices such as modems, Group III facsimile machines, or voice sets can be connected to the jack. An RJ-45 connector on the back bracket connects to the ISDN line.

Hayes has developed an **ISDNBIOS** software interface that may soon be considered an inspired work. It supports an extended version of their common **AT** command set allowing current data communications programs such as Pro-Comm or Telix to use **ISDN**. But it also closely resembles the **NETBIOS** ubiquitous in the **LAN** arena for multisession and bridging activities. It allows you to use **B** channels using either the **CCITT V.120** protocol for **ISDN** or the ordinary **X.25** packet switching protocol. Using **X.25**, the Hayes product can be configured for up to eight simultaneous sessions on a single **B** or **D** channel.

The brains of the Hayes adapter are uploaded to RAM on power up. In this way, should **ISDN** develop to add additional features, the upgrade will involve software rather than hardware. Applications software can view the Hayes device as either a serial port or as a shared RAM type port using **ISDNBIOS**. As a serial port to **ISDN**, speeds of up to **38.4 kbps** are supported. Using **ISDNBIOS**, actual data transfers in excess of **50 kbps** can be accomplished.

Until more applications software is developed, existing communications programs can view the **ISDN** adapter essentially as a Hayes Smartmodem. The **AT** command set has been extended a bit. And the session will be limited to **38.4 kbps**. But that is a true **38.4 kbps** - no magic numbers based on theoretical maximums achieved by compression voodoo.

To get the rest of the world online with them, Hayes has announced a very attractive developers support program. During the first quarter of 1990, Hayes will offer documentation on the enhanced **AT** command set for **ISDN**, a **Hayes ISDN BIOS Interface Programmers Guide**, and some technical notes

on the **ISDN** product. They will also hold a developers conference and provide technical support including **ISDN** lines for developers to test their products.

During the second quarter of the year, Hayes will provide **ISDNBIOS** interface applications development tools, product manuals, and special pricing on a limited number of the adapters to qualified developers.

The **ISDN** Adapter will be generally available during the third quarter of 1990 at a list price of **\$1599**. Hayes will assist developers in marketing their products through a complementary marketing program.

Hayes has already set up an **ISDN** developers conference area on their **ONLINE WITH HAYES** bulletin board system at **(800)874-2937** or **(404)446-6336**. Developers may register for the **Hayes ISDNBIOS Interface documentation** for **\$125**. Contact Hayes customer service at **(404)441-1617** in the United States, **(416)283-2627** in Canada, **(852)845-9818** in Hong Kong or **01-848-1858** in the United Kingdom. Hayes Microcomputer Products, Inc. P.O. Box 105203, Atlanta, GA 30348.

WIRELESS RADIO NETWORK FOR LAPTOPS

IBM and Motorola have teamed up to form a new company titled Advanced Nationwide Radio Data Service or ARDIS to link laptop owners everywhere via a commercial version of packet radio. The service is set to launch April 1, 1990.

The new offering is based on an existing network in which IBM and Motorola have already invested nearly seven years and several hundred million dollars. It consists of over **1100** base stations covering **8000** cities, over **97%** of the metropolitan areas within the United States. Approximately **16,000** IBM field service personnel use the service to communicate.

Essentially, the Ardis service operates in the **800 MHz** frequency range at transfer speeds of **4800 bps** and supports **3270 emulation, X.25 packet connections, asynchronous, synchronous, and SNA LU 6.2 protocols**. Eventually, the system will operate at up to **19,200 bps** and in fact, the system has already been tested at that speed.

The service will effectively work as a telephone bypass in many ways. Users will be able to connect to their own databases back at the office or home, commercial online databases such as CompuServe, GEnie, Dialog, and MCI Mail, and virtually anything else online as well. Ardis is not at all particular about the protocol you use.

The product is aimed at the estimated ten million field service/delivery personnel and "mobile professionals." According to Motorola, pricing will be based on transmitted packets at approximately a dime each. It is expected that the typical user will spend between **\$100** and **\$150** on the service monthly. Ardis will assist users with the necessary FCC licensing to operate the modem.

Currently, the service is accessed by a tiny hand-held terminal device - the **Motorola KDT 840 Terminal** featuring a tiny screen and keyboard, built-in radio, and modem. But RF laptop modems - essentially the **KDT 840** less keyboard and screen - are expected by the third quarter. Until then, you may use the **KDT 840** as a modem for your current laptop system. The bad news - the **Motorola KDT 840** starts at about **\$3300**.

Both Sears, with **19,000** field service technicians, and New York Life, with **11,000** insurance agents, have taken a strong interest in the program. While the service has the potential for serving areas where cellular telephone service is unavailable, it sounds pricey. Both IBM and Motorola are known to be quite proud of their products pricewise. Ardis, 300 Knightsbridge Parkway, Lincolnshire, IL 60069; (708)913-1215.

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"Exec-PC, the bulletin board answer to SuperStation WTBS, connects PC users continents apart." *PC World*

"One of the best is Bob Mahoney's Exec-PC out of Shorewood, Wisconsin..." *PC Magazine*

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"Exec-PC Network is by far the largest BBS we've ever seen. You say you want files? This board has them—whatever kind you want... In addition to having one of the largest selections of public domain software, this BBS is a good source for technical information and help." *PC Resource Magazine*

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Our BBS also has an active conference system where thousands of people share ideas and solutions. Some conferences include: PC General Topics, Communications, For Sale, Programming, Desktop Publishing, LAN, Graphics, Hardware Speedup, CAD/CAM, Private e-mail, etc. Why pay expensive consultants when there are hundreds of experts available in our forums and conferences?

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SOUTHWESTERN BELL VERSUS TEXAS BBS OPERATORS

Southwestern Bell has hardly been a friend to electronic bulletin board systems. But with the advent of their own Sourceline Gateway service, the company has for all intents and purposes declared war on the very existence of a phenomenon they understand only dimly.

Essentially, after battling with the operators for nearly over two years, Southwestern Bell has announced their intention to proclaim all electronic bulletin board systems "businesses" and charge them business rates for residential telephone access - a \$35 per line charge versus the \$13 residential rate.

In response, the Coalition Of Sysops and Users Against Rate Discrimination (COSUARD) has filed suit against Southwestern Bell Telephone in Reginald Hirsch et al vs. Southwestern PUC docket 83-87. The suit alleges cross subsidy of Southwestern's Sourceline Videotext offering by Southwestern Bell, antitrust violations, and seeks some definition of electronic bulletin board systems.

Southwestern Bell has insisted that they have adopted their "all BBS are businesses" stance as a result of recent failure of BBS operators to agree to a definition delineating hobby BBS from commercial services. But according to COSUARD president Ed Hopper, the facts just haven't borne that out. During deposition, a memorandum dated May 1988 provided a script for service representatives responding to requests for second line installations. The script called for business classification of telephone lines if the system was used for BBS purposes, - including just calling BBS, or calling your place of employment on a regular basis to transfer files.

Just a few months later, Southwestern Bell obtained a list of BBS from a local user group publication and wrote letters to all listed BBS operators informing them of their change in status to "business customer" at the higher rate. The resulting uproar caused SWB to back down and the Texas Public Utilities

Commission at that time came down squarely on the side of the BBS operators.

The current continuance of the battle involves the difference between hobby based BBS and small commercial information services. The trial is currently scheduled for March 24.

If Southwestern Bell intends to view hobby electronic bulletin board systems as "the competition" to their videotext gateway offering, it would seem clear that they have a rather pathetic lack of understanding of PC data communications - an unseemly situation for a telephone company. More to the point, the timing of their war on BBS has been so obviously waged concurrently with the introduction of their own videotext offering as to make these actions virtually criminal in nature and intent. Obviously they realize that by far the majority of BBS in Texas would simply evaporate under the burden of the increased rates. Hobby BBS systems struggle even at \$13 per month. Most have no cash flow or a pittance from voluntary user contributions. This decimation of the ranks would ironically be a great boon to the truly commercial BBS systems - and of course to SWB's own videotext service.

In a sense, BBS are competition for SWB. Callers must ask themselves why they should pay SWB their cut for the SWB videotext service to access services often similar to that available for free from a local hobby BBS.

All the RBOC have been lobbying the US Congress furiously to subvert Judge Greene's ban on their entry into information content development. That ban was put in place to allay fears that RBOC would quash competing information service providers using the power and position of the telephone company. The RBOC have all insisted that they are real nice guys and they would just never do that. The actions of SWB in Texas prove beyond any doubt just what RBOC will do given any opening at all. They will use whatever tools are at hand to quash competition wherever they perceive it to exist.

It is most fortunate that SWB showed their colors early and in a relatively harmless way. It illustrates most graphically why Judge Greene's interpreta-

tion of the Modified Final Judgement is correct. If RBOC are allowed in the information business, they will BE the information business. And that will essentially kill it. We urge you to write your Congressional representatives directly to express your concern before it's too late.

Developments in the COSUARD case may be monitored on several echoed conference areas including Fidonet's **FIGHTBELL**, Interlink's **COSUARD**, and UUCP Usenet's **ALT.COSUARD**. Additionally, COSUARD president Ed Hopper operates a BBS at (713)782-5454 and COSUARD's attorney, Reginald Hirsch operates Ye Olde Bailey BBS at (713)520-1569.

PCBOARD VERSION 14.2 ANNOUNCED

Clark Development Company, Inc., of Murray Utah, released of version 14.2 of their popular PCBoard BBS system this past December 22. Most notably, this release supports multilingual operation, allowing callers to specify the language of their choice at logon with all subsequent prompts displayed in that language. The language selection may be changed at any time while online. This allows BBS systems to serve a varied language constituency - important in many areas of the world, Quebec for one example, where the local population operates on more than one tongue. In some areas, language is a matter of law, posing specific problems for BBS operators.

The new release also supports the newer high speed modems at rates up to 38.4 kbps and message quoting. Additionally, a number of commands have been added that previously required a third-party program such as ProDoor. These include a function to view ZIP files, a batch download function, and a message packer that will assemble all your messages into one package for download and offline reading. Pricing varies from \$120 for a single node system up to \$920 for the 99 node network version.

PCBoard, originally derived from the public domain RBBS program, has grown in popularity and features in recent years. It provides multiline operation of a BBS by networking individual PCs into one system with each PC serving a single access line. While this results in a good bit of hardware to serve several lines, it does provide the flexibility to run external third-party software, often termed "doors", as part of the BBS. Most BBS software that allows multiline operation from a single PC, by contrast, requires much less hardware but is much less flexible in the external programs it can run as well.

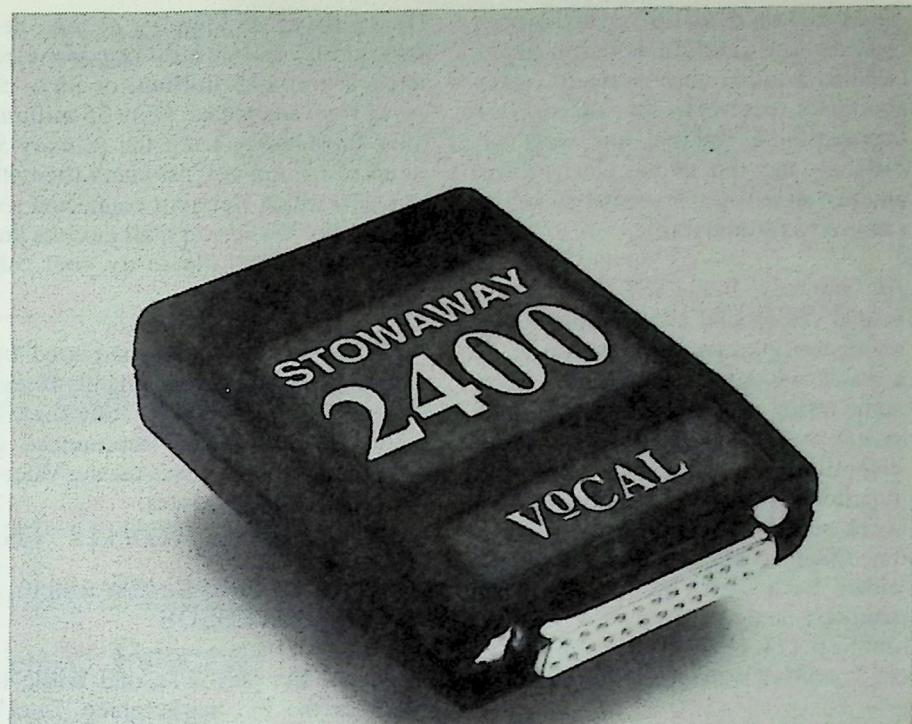
Rumors of a 14.5 release persist. This release should be a conversion to C language for a bit better speed. Clark Development also operates an excellent product support BBS titled SALT AIR at (801)261-8976. Clark Development Company, Inc., P.O. Box 57365, Murray, UT 84157; (801)261-1686.

THE TERM INFOPRENEUR A BONE OF CONTENTION

On a number of occasions, we have used the term "infopreneur" to describe an entrepreneur in the field of information services. Although we consider the combination a bit obvious and we thought moderately original, there is a minor controversy brewing over who first coined the term. Clearly we didn't.

A Canadian subscriber, Ray Sauriol of Toronto has forwarded a Certificate of Copyright Registration from the Consumer and Corporate Affairs Copyright Office in Canada for an unpublished work the title of which is listed as *THE INFOPRENEURS*. The Registration Date is listed as January 7, 1985.

On the other hand, Harold F. Weitzen authored a book titled *Infopreneurs - Turning Data Into Dollars* with a 1988 Copyright. Mr. Weitzen goes to some pains to stake a claim to the word. He went to the trouble of actually registering a trademark with the United States Patent and Trademark office, number 1,352,733, on the word Infopreneur on August 6, 1985 claiming a first use on January 31, 1984. Will the real originator of this term please come forward?



LINE POWERED POCKET MODEM

Laptops and modems are a natural combination. For the little bit of circuitry they require, you would assume that a 2400 bps modem would come built-in to most laptops. Sadly, they not only aren't but modems that are available as add-ons are inordinately expensive.

Most cost conscious laptop trail trampers opt for one of the less expensive pocket modems. These plug into the serial port usually available on laptops. But even pocket modems tend to be about the size of a deck of bridge cards and usually require a 9V battery to power their operation.

Vocal Technologies Limited has developed an attractive pocket modem titled the STOWAWAY 2400 addressing a couple of these shortcomings. First, the modem is tiny. It measures 2.2 X 3 X 0.8 inches and weighs but 2.2 ounces. Secondly, it uses no external AC power or batteries. Prior to going off-hook, the modem draws about 15 milliamperes from the RS-232 port. Once off-hook, it draws its power from the telephone line.

The unit features full AT command set compatibility and MNP-5 error correction for \$225. That's pretty reasonable for a 2400 bps MNP-5 pocket modem. The company is also planning a combination 2400 bps modem and 9600 bps Group III facsimile device also in a pocket format. No pricing on that unit is available as yet. Vocal Technologies, Ltd., 3032 Scott Blvd., Santa Clara, CA 95054; (408)980-5181 voice; (408)980-8709 fax.

ATT NETWORK FAILURE

On Monday, January 15th, the AT&T long distance network suffered its worst system failure ever. A large section of its network failed for nearly 9 hours causing an unheard of 44% call failure rate during Monday. AT&T still carries 70% of the long distance traffic in the United States.

The cause of the breakdown is a bit complex. AT&T had recently installed a software upgrade in their Signaling System 7 network. SS7 operates on an adjunct processor connected to model 4ESS switch assemblies. On Monday afternoon, a 4ESS switching unit located in lower Manhattan began having difficulties with its trunk interface. It

signalled a second 4ESS switch to stop sending traffic while it performed a clearing routine that normally takes about five seconds to accomplish. This happens quite routinely and automatically. At the end of the clear, it sent another signal to the second switch to cause it to resume traffic.

An "anomaly" in the SS7 software prevented the second switch from recognizing the first signal to pause traffic. As a result, when the second signal to resume traffic came in, the second 4ESS switch was completely confused and determined that it had an internal malfunction. So it took itself off the network and signalled the next switch in line that it would not be receiving calls either. Each switch up the line reacted similarly and the process avalanched until all 114 4ESS switches in AT&T's SS7 network were gone by 3:00 PM.

Traffic was rerouted to the Signaling System 6 network, still completely operational, and the search for the problem began. By 6:00 PM, a software patch was developed and distributed that alleviated most of the problem. Distribution was completed by 11:30 PM. A complete patch was not completed until Tuesday evening and by Wednesday night all the 4ESS switches in the SS7 network had been patched to operate normally.

During the entire Monday 24 hour period, a total of 148 million calls were attempted and 83 million, or 56% of them, were completed. Only 35 million were completed during the primary 9 hours of disruption. Customers attempting calls which were not connected received the "We're sorry, all circuits are busy at this time. Please try your call again later" recording.

AT&T is enormously embarrassed by the failure. SPRINT immediately began advertisements pointing out that it didn't fail and AT&T announced it would offer all calls made during Valentine's Day at holiday rates.

MOTOROLA SHIPS NEW 68040 MICROPROCESSOR

Motorola has played second fiddle to Intel in the PC marketplace. Intel's 80x86 chip series has powered the vast majority of personal computers since the success of IBM's first PC in 1981. But the Apple Macintosh world has used the Motorola 68000 series beginning with the introduction of the first Macintosh. The Motorola 68030 has been the power in the latest Apple offerings including the ci and cx models. NeXT Inc. also uses the 68030 along with several engineering work station firms.

Motorola's latest chip, the 68040, began beta shipments last month and should be shipping in quantity during the second quarter. The 25 MHz chip triples the performance of the 68030 with a performance of 20 Million Instructions Per Second (MIPS).

The chip is comprised of 1.2 million transistors compared with 300,000 in the earlier 68030 model. It will run all software designed for the 68030 and most instructions actually execute on a single clock cycle - after the fashion of the current Reduced Instruction Set Computer (RISC) technologies. In fact, the 68040's 20 MIPS performance outshines Sun's SPARC processor's 18 MIPS. The Sun SPARC chip is often touted as a RISC success story. The Intel 80486 chip, by comparison, is capable of a 15 MIPS rate.

The 68040 also incorporates the 68881/68882 external floating-point math co-processor chip internally as well as 4 KB cache memories for both instructions and data. This built-in math coprocessor function allows the chip to perform 3.5 Million Floating-point Operations Per Second (MFLOPs) compared to the SPARC's 2.5 MFLOP and Intel's 1 MFLOP performance.

The result is a screamer of a microprocessor. Motorola is a bit proud of this package at \$795 per chip, but it is undeniably a very capable chip. Plans for a 50 MHz version of the 68040 should prove very interesting and we've even heard rumors of work in progress on a 68050. Rumors of a next NeXT based on the new chip abound. Motorola Inc., 6501 William Cannon Dr., Austin, TX 78735; (512)891-2000

SUPRAMODEM 2400 PLUS

Supra Corporation of Albany Oregon has joined the ranks of those announcing support for the new CCITT V.42bis standard. Their new SupraModem 2400 Plus provides connections at 2400 bps but a theoretical throughput of up to 9600 bps when connected to another V.42bis modem. Implicit in V.42bis is the ability to connect with MNP-5 error correcting modems as well.

Supra has developed a bit of a name among BBS operators running multiple lines at 2400 bps and slower due to the





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very low cost of the Supra device, the smallness of the package, and its cool operation. The units use an Intel chipset that requires very few support chips. The resulting package is small, and inexpensive while offering reasonably good noise resistance. The case is extruded aluminum and the units use little power. The new SupraModem 2400 Plus carries a very reasonable list price of \$199 - the least expensive V.42bis implementation we've seen yet. Supra Corporation, 1133 Commercial Way, Albany, OR 97321; (503)967-9075 voice; (503)926-9370 fax.

VARIOUS ITEMS

We often bandy about a number of terms indicating a quantity of data. Just what is 500 MB of data? Well, technically it is 524,288,000 individual characters. In paper form, this would amount to about 128,000 sheets of paper. Using 20 pound stock, this would be a pile 42.25 feet high weighing approximately 1280 pounds. Using ordinary 360 KB floppy diskettes, this mass reduced drastically to a scant 1422 diskettes barely 8-feet tall and weighing a bit over 51 pounds. A single CD-ROM of course can hold the whole thing at about 3.5 ounces and you can carry it in your coat pocket without much trouble.

Caller ID telephone services display the telephone number of incoming calls. Availability has sparked debate as to who has a right to privacy, the caller or the called. We side with the called. A Pennsylvania judge has blocked implementation of Caller ID temporarily. But both the Florida Public Utilities Commission and the Tennessee Public Utilities Commission have given it the green light for their states.

Sweden has the highest ratio of telephone lines per 100 population with 70. The US averages 50 and Japan 40. Eastern Bloc nations aren't doing quite so well. Czechoslovakia sports 14, East Germany has 11.2, the USSR has but 9.7, and Romania just 7.5. We wonder if this at all relates to the number of adolescent females in each country.

The FCC has released some data on the number of domestic telephone lines connected to various long distance car-

riers at the end of 1988. While carriers such as MCI and Sprint have made some inroads regarding business use, AT&T remains the carrier of choice at home. AT&T had 124 million connections (80%) while the next four carriers together, including MCI and Sprint, shared 20 million (16%). Another 3 million lines are carried by a little over 200 "other" carriers.

The U.S. Department of Commerce estimates 1989 information services revenues at \$7.5 billion and they project an annual growth rate of about 20% for 1990. The largest share of this is online credit reporting and money market services. The *1990 Industrial Outlook* manual is a 600 page tome priced at \$27 and it analyzes over 350 different industries providing 400 tables and charts. Available from the U.S. Government printing office (S/N 003-009-00562-1) in printed form or from the National Technical Information Service in electronic form (PB90-104522KOA). Call (703)487-4650 for more info.

Smithsonian Institution sponsors an interesting voice dial-up at (202)357-2000. Titled DIAL A PHENOMENON SKYWATCH the recording describes celestial happenings for the evening.

What's the most popular 900 service? We're told that American Express Weather Report gets some pretty heavy traffic at 900-WEATHER. You may enter your area code and get the current time, temperature, wind chill, humidity, and forecast. In our case, the service even includes ski condition reports.

packet services have expanded the number of cities on their networks and they are slowly adding higher speed modem capability.

Essentially, packet data services provide a national long distance network for data communications that bypasses the conventional long distance data carriers. In this way, an information service can allow callers to access their system by dialing a local number. The modem on the local number is connected to a packet assembly/disassembly device (PAD) that in turn is connected to the packet long distance network. When you dial CompuServe, you really are dialing a local number but through the modem connected to it you are actually connected to a computer in Columbus Ohio.

Packet data services are exempted from paying the access fees that long distance voice carriers pay to local telephone companies. As a result, packet data networks can offer evening connection between cities for as little as \$2 to \$5 per hour as opposed to the \$7 or \$8 per hour for voice connections.

Packet gets its name from the way it handles data. The PAD breaks your data stream into packets of data that each include an origin and destination address. These packets go onto a high speed Direct Access Facility (DAF) line that may carry several dozen calls simultaneously over a single line. These packets are then routed by switches located throughout the country to different destinations depending on their enclosed address. The usual trite analogy is of automobiles entering and exiting an interstate highway. En route, they all share the same highway although they are going to different end destinations.

At the other end, the PAD collects the packets from each destination and sorts them out into the different original data streams. These are referred to as LOGICAL CHANNELS. Physically, they all come in on one wire but logically, they are separate communication links.

Packet has some problems - most of them involving speed. When the PAD in your local city breaks up your transmission into separate packets, the packets behave somewhat independently. They are sent to the switch network and

UNLIMITED ACCESS

PACKET DATA SERVICE ACCESS NUMBERS

The packet switching market has enjoyed some mixed success lately. The higher speed modems have reduced the cost of direct dial to the point that packet no longer makes sense for many applications. On the other hand, the

PACKET DATA LOCAL ACCESS NUMBERS

PACKET DATA LOGON ACCESS NUMBERS				
Service	Data Access	Prompt:	Response	Voice
CompuServe	(800)848-4480	Host name:	NETWRK	(800)635-6225
Telenet (Sprint)	(800)546-2000	@	MAIL	(800)336-0437
		USERNAME:	PHONES	
		PASSWORD:	PHONES	
Tymnet	Local Number	Login:	INFORMATION	(800)635-6225
GENie	Local Number	Any prompt	PHONES	(800)638-8369

destination is not the only priority for the switch. If the next switch toward the destination is busy, the switch will likely send the packet to an alternate switch - perhaps in the other direction. This alternate switch will then pick the closest switch toward your destination - again subject to switch loading priorities. As a result, some data packets go pretty directly to their destination, some wander around a bit. As a result, the first packet sent might be the third packet received, the third might be second, and the second eighth. The PAD can sort all this out from the packet header information of course, but the delay can be significant.

Additionally, the links between switches in different cities may be fiber, ordinary copper, satellite transmit, or a combination of all three. When you consider this complexity, it is something of a miracle that packet works at all.

The original impetus behind the development of the ZModem protocol was to overcome some of these problems. The old XMODEM protocol would transmit a packet, and wait for an acknowledgement from the receiver. The delay was often longer than XMODEM was programmed to wait. The result was excruciatingly slow file transfers if they went at all. ZModem largely eliminated the problem.

The economics of packet are such that CompuServe, GEnie, American Peoplelink, USA Today, and other services can be priced at about the same rate as you would pay for a standard long distance voice call and still make money. If they charge \$7.50 per hour and pay Telenet \$4.50 hourly for your time on the network, they still make \$3 hourly. In many cases, they pay Telenet

as little as \$2.50 hourly (CLASS A cities - normally major metropolitan areas). In a few cases, from CLASS C cities (remote rural areas), they may pay as much as \$12.00 per hour. But on average, they make a good profit while still providing online services for about the cost of a long distance voice call.

Logging on through a packet service can be a bit of a challenge in some ways. But most callers use script files to dial the local access number and perform the logon. The problem comes when traveling. With the increasing use of laptops and modems, communicators on the go face the problem of determining the local access number in the city they are visiting.

Telenet and CompuServe have a very good solution for this. These services provide a toll-free 800 number you may dial to download a list of access numbers. The CompuServe number, for example, allows you to enter **NETWRK** at the **Hostname:** prompt to access a free service providing every access number in the network. Telenet requires a bit more logon. Enter **MAIL** at the **@** prompt and **PHONES** at both the **USERNAME:** and **PASSWORD:** prompts.

Tymnet and GEnie are both a bit less accomodating. Tymnet provides an excellent information service on their network. Dial any node and enter **INFORMATION** for a complete list of access codes sorted in a number of different ways. The problem here is that if you had the access number with you, what would you want a list of access codes for? If you had the foresight to dial Tymnet before the trip and download the list to a file, you would be in good shape. Alternatively, you can call their

toll-free voice number and one of the representatives will look it up for you - very high tech.

GENIE works the same way. Enter PHONES at any prompt and you can look up access codes by state or by area code. But you can't do this via an 800 number. They too will be happy to look it up for you if you call their 800 voice line.

TELECONNECT MAGAZINE BBS

David Hakala

Next to Jack Rickard, my favorite editor is Harry Newton (Can you guess which one buys my malarkey each month?) A certified loose cannon, Newton rains all over the desert of technical drivel in Teleconnect magazine. If you want help buying a PBX, ACD, UPS or other acronymic telecomm product, turn to Teleconnect; the medicine won't taste so bad going down. Newton also provides the juiciest industry gossip, and incisive comments on the interconnect business, such as "Marketing is simply sales with a college education."

Now Newton has come to plague BBS-land too, with a TBBS system accessible at (212)989-4675. The system seems to be named "The Electronic Bulletin Board of Teleconnect Magazine," but I'll just call it Harry's BBS. It provides an online index to Teleconnect and Inbound/Outbound, a magazine for telemarketers and voice information providers.

There's also a vendor database listing names, addresses and phone numbers of every company whose products have been reviewed in both magazines. That's a lot of companies, though the

Letter Quality Print from an El Cheapo Printer

Yardley, PA -- Scientists say that human beings use only about five percent of their available brain capacity. Much the same could be said of the typical nine-pin or "nine-wire" dot matrix printer. They're fine for quick drafts and screen dumps, but few produce business correspondence you can be proud of.

Well, if you have an IBM or compatible computer, stand by for a big surprise. You really *can* get quality from an inexpensive nine-pin dot matrix printer so good that you will absolutely not believe your eyes. Crisp character definition, a wide variety of fonts (typestyles), and special print features so impressive that the correspondence you produce need never take a backseat again.

And the price? The price may be the best part of all, since the software that makes all this possible is shareware. That means it's widely available, usually for the cost of a disk and postage or several minutes of online time.

It also means that you get a full-blown, commercial-quality package, complete with an on-disk manual ready for printing. But most important of all, it means that you don't have to pay the programmer even a portion of the modest, voluntary registration fee if you don't like the product. It's "try-before-you-buy," software on the honor system.

Trouble in Paradise

There's just one problem with shareware and its close cousin, public domain (PD) software: There is so much of it that it's nearly impossible to know which programs to get.

CompuServe, GEnie, BIX, and others have tons of the stuff for you to download. So do most bulletin board systems (BBS). But how many times have you been online and, intrigued by a file's description, decided to download it -- only to find that it's either trash, or buggy, or not at all what you were looking for? Worst of all, obtaining that clunker just cost you maybe half an hour of connect time or long distance charges.

Mail order firms are generally a less expensive alternative. But have you seen their catalogues? Most offer dozens of programs for each application --

15 spreadsheets, 45 word processors, 10 zillion communications programs, and so on. Yet most give you only a single, sparse sentence of description to go on.

So what do you do? You end up ordering -- and paying the distribution fee for -- several disks in each category. Then you spend hours going through them: printing out the documentation, running the program, feeding it sample data, and taking notes on what you like and dislike about the package compared to the others in the pile.

By the time you're done, you're convinced that "free" or not, shareware is no bargain. You add up all your costs and realize you'd have been better off spending several hundred dollars on a commercial package.

And how do you know whether you can count on the programmer to give you the support you need once you send in the registration fee? You could phone each one individually, but who has time for that?

The Answer

If only you could commission someone to do the work for you. Well your wish is about to come true, for St. Martin's Press has published Alfred Glossbrenner's *Master Guide to FREE Software for IBMs and Compatible Computers* (530 pp. \$18.95). This is the book longtime Capital PC SIG chairman and ABC News correspondent Brit Hume called "one of the all-time best books" [*Washington Post*].

It's the one about which *New York Times* columnist L. R. Shannon wrote: "If you cannot find at least a couple of pro-

grams that will pay for the price of the book, you haven't read it."

Packed with hands-on tips and tricks -- how to quickly and efficiently tap the free software libraries of all the leading online systems, for example, not to mention BBSs, user groups, and mail order firms -- it's even got a "Background and Basics" tutorial for new and inexperienced PC users.

Written by the author of *The Complete Handbook of Personal Computer Communications* and over a dozen other books, this is the one that doesn't pull any punches -- it tells you exactly which programs to get and why. Including how to get letter-quality output, fonts, and lots of other things from an el cheapo printer.

You'll find copies in all major bookstores and libraries. But as a special offer for *Boardwatch* readers, we'll send you both the book and a disk with the two best letter quality print programs for just \$18.95. (Please specify disk size.)

If you want the disk only, send \$5 for 5.25-inch or \$6 for 3.5- inch media, and ask for PRINTER Disk 2.

The latest Glossbrenner's Choice shareware/PD catalogue and book brochures are available free of charge. Make checks or U.S. dollar money orders payable to FireCrystal Communications. Contact:

FireCrystal Communications
699 River Road
Yardley, PA 19067
(800) 628-7637

Figure 1. Three of more than 20 fonts supplied on Printer Disk 2.

Courier

ABCDEFGHIJKLMNPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
The quick brown fox jumps over the lazy red dog.

Helvetica

ABCDEFGHIJKLMNPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
The lazy brown dog bites the quick red fox.

Monospace

ABCDEFGHIJKLMNPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
When the dog bites. . .

database is no more than a White Pages directory. If Newton included some product buzzwords, we'd really have something here. Still, if someone says "Zyztek has the thingamajig you need. I read about it in Teleconnect, but can't remember where they are," Harry's BBS will deliver.

Subscription and advertising rates are prominently offered, as well as an electronic order desk for the Teleconnect Library, a collection of books ranging from the useful *Dictionary of Telecommunications Terms* to the strange, like Harry's how-to-succeed workbook. There's no online catalog available yet, another indication of the board's youth.

Harry had the hot idea of providing an online employment service where telecomm jobhunters could leave their resume's and employers could search for sellers, installers, managers, etc. For some reason, he called this a "job listing" service, though there was no help-wanted advertising feature. Employers were given 20 minutes to browse through the coded resume's online. If you wanted to interview "SALES-103," you had to call Teleconnect voice and cough up \$250 for the original resume', which would be sent via Federal Express.

Needless to say, Teleconnect received hundreds of resume's for free data entry, but virtually no employers called. The "job listing" service has been discontinued until Harry figures out what went wrong. I left a couple of suggestions before logging off.

Despite its embryonic shortcomings, Harry's BBS is a promising addition to the online scene. Newton is a prodigiously creative, market-driven entrepreneur who is not afraid to try the outrageous, and smart enough to make it profitable. I plan to log on frequently to see what else he comes up with. Teleconnect: 12 West 21 Street, New York NY 10010; (212)691-8215, modem: (212)989-4675.

TURBOTAX SUPPORT BBS

It's that time of year again and Uncle Sugar does want his pound of flesh via a tax on income. Often worse than actually paying the money is figuring out how much of it to pay. Our system of tax

laws has grown to gargantuan proportions and even the best efforts at "simplifying" just seem to make it grow more. At this point it would seem that not one good man actually "knows" the tax law and the annual ante now resembles more of a negotiated settlement than a levied tax. The stories of misinformation from the IRS are so cliche at this point that journalism graduates may expect to do the story on the percentage of wrong answers from the IRS as part of their coming of age at their first newspaper or television station.

The personal computer has essentially given Joe Citizen a bureaucratic tool of his own with which to fight back. From the early 1040 templates for Lotus spreadsheets, we've moved into dedicated software programs that allow you to enter a few choice tidbits of your personal life, and in response, generate a hurricane of paper in quantities sufficient to keep a Mongol Horde of IRS people happy for weeks.

Chipsoft Inc. has enjoyed some large measure of success with their **TURBOTAX PERSONAL 1040** program. Chipsoft has done so well in this market that they've expanded their line to include state income tax forms, a professional tax preparer's package, and several general accounting tools.

The Turbotax program has improved noticeably each year. A retail price of only \$75 has made it attractive to many. Version 7.01 of this product began shipment January 19th. In its current release, Turbotax not only allows you to fill out your 1040 form and ALL supporting forms, but it will actually print out the data on an IRS approved form - particularly attractive output if you have an HP Laserjet Series II compatible printer.

The company now provides online support via a PCBoard bulletin board system at (619)453-5232. The system provides information on all their products along with an online order entry capability, news of updates, and a message area where they answer user inquiries on various problems with the software.

One item catching our eye was their new Chiplink product. The Chiplink Professional version requires an annual

fee of \$250 and a per return fee of \$6 to allow professional tax preparers to submit client tax returns electronically to the IRS via a service operated by Nelco [(414)337-1000]. The Personal Chiplink product is only \$11.50 plus \$15 per return.

Chiplink essentially takes the data directly out of your Turbotax data file, formats for IRS submission, and dials the Nelco online service to submit the return electronically. Alternatively, you can save the resulting file to disk and mail it in. In either case, you have to mail an IRS FORM 8453 anyway so the convenience is a bit lost on us. But this electronic filing for tax refunds seems to be catching on. It is limited to those expecting refunds and there are other restrictions such as the number of dependents, number of other sources of income, etc. But the IRS processed 38,000 electronic filing submittals last year. As of January 31 of 1990, they had already processed 115,000 of these returns. Chipsoft Inc., 5045 Shoreham Place, San Diego, CA 92122; (619)453-8722.

FEDERAL RESERVE BBS

The Federal Reserve Bank of Minneapolis has erected a most intriguing system inexplicably titled **KIMBERELY** at (612)340-2489. This system, though technically modest, offers some very timely economic data by the people who should know.

The system uses RBBS software with a fairly Spartan design. The only message area available allows comments on the system to the operator. Utilities are provided to set your password, terminal parameters, and download protocol.

The meat of this board is in the file areas. The system looks so sparse that it seems an unlikely source of useful information. All the data available is simply dumped into text files and made available for download. It's main forte is a library of over 250 text files, almost all of which deal with the Federal Reserve banking system and the economic statistics involved.

We found files delineating the history of the Federal Reserve, biographies of the entire Board of Governors and lists of branch officers, directors, and senior of-

ficers. There were some very interesting files providing the full text of speeches on various economic and monetary issues delivered by noted economists. There were informational reports available on a number of individual banks and economic forecasts - primarily for the northern Midwest region of the country.

But the main jewel on this system is a file titled **CURRENT.FIN** that is updated daily. This text file is a simple table listing the Prime Rate, Fed Funds rate, 3-month Treasury Bill rate, and the bank discount rate over the past twenty days. Essentially, you can dial this system and get the key interest rate indicators on a daily basis.

Another file lists bond rates in 1, 2, 3, and 5 year denominations for each month since January 1980. This historical record provides some interesting indication of interest rate trends over the past decade.

The system also provides news releases issued by the Federal Reserve and the text of a newsletter titled **The Fed Gazette**. **KIMBERELY** should provide a welcome source of information to the financial world. Office of Public Affairs, Federal Reserve Bank of Minneapolis, 250 Marquette Ave., Minneapolis, MN 55480; (612)340-2443 voice.

MIDDLESEX NEWS BBS

Newspapers in general are a bit suspicious of electronic bulletin boards and online communications services. They smack of telephones and television and other anathema to the Newspaper business. Apparently, most newspaper publishers live in terror that the telephone companies and cable television networks are going to put them out of business. Rather than meet this head on, most daily newspapers attempt to pretend that online information isn't really happening - a cunning ploy almost certain to effectively forestall the future.

A Massachusetts newspaper, **The Middlesex News**, is a notable exception. The paper operates a delightful TBBS system titled **FRED THE COMPUTER** at (508)872-8461. And Fred operates as a valuable contributor to the paper's operation.



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- Easy Access For PC Pursuit and Starlink Callers!

To Call By Modem: (818) 358-6968 (3/12/24 Baud 8N1)

Other local access numbers include: Pasadena (818) 568-3372
Glendale (818) 241-2943
West L.A. (213) 859-8128
North Hollywood (818) 763-1161
Voice Info (818) 357-9570

For one thing, Fred has an Issues of the Week section where callers can voice their opinions on whatever the hot buzzwords and news items of the day are. Each Monday, a compilation of these comments appears on the Business Page of the Middlesex News. Additionally, you can call Fred to order a subscription to the paper and each evening, a teaser file titled Tomorrow's Headlines lists the main headlines and a brief story synopsis of what will appear in tomorrow's headlines.

According to Adam Gaffin, Medical Reporter for Middlesex News and Fred's "housekeeper", they also use the system to allow reporters to phone in stories by modem. Although the limited budget for Fred restricts the system to a single telephone line and 1200 bps modem, it has contributed to the operation of the paper.

We found several other items of interest that had been carefully culled from the Associated Press news wires. Wierdnet, for example, is an area of text files containing oddball stories. We thought the story of the drunken pig festival qualified in that area as well as the strange story of a 70 year old man killed by a runaway grocery store shopping cart. The story of students carrying around

trash bags to store all the garbage they generated for a week sounded environmentally aware if a bit gamy.

In another section titled Science Watch, we found a collection of oddities of science. A story on lightning was illuminating. It seems someone measured the intensity of lightning strikes across country and found that it varied in intensity with latitude. Florida lightning strikes averaged 45,000 amperes while New England was lucky to muster an anemic 25,000 amps. Another story described the possible causes of a decrease in the age of onset of puberty in girls from 17 about 150 years ago to age 12 1/2 today. They claimed nutrition played a role but we're convinced it's a combination of tv, pizza, and blow dryers.

Despite a lack of resources, Fred is entertaining, informative, and a good example of the almost inevitable marriage of the print publishing industry and online technologies. Good writers create good bulletin boards, not necessarily the reverse. Middlesex News, 33 New York Ave., Framingham, MA 01701; (508)626-3968 voice.

TOLL-FREE dBASE BBS AVAILABLE NATIONWIDE

Ashton-Tate has suffered enormous reverses in their dominant position as the top PC database program vendor. Their dBase IV product has largely been rejected even by the dBase loyalist community which has fallen back to the use of dBase III Plus. The company has lost nearly twenty million dollars in each of the last two quarters and key people are leaving the company at a parking lot emptying rate. Even with enormous legal resources, the company is finding it difficult to convince the courts that it owns the rights to the concept of a PC database as well as database programming languages. If you can convince a court of law to rule the existence of your competition illegal, you are virtually assured a small profit anyway.

But if that doesn't work, Ashton-Tate has a backup plan B - put up a bulletin board system. We think that's a fabulous idea. Actually, their support services department has operated a Galacticomm system for some time on a direct dial. But just recently they've joined the CompuServe Network to allow callers from all over the country to access the system at no charge at all. It is not limited to registered software owners and it does provide some pretty interesting stuff.

To access the system, dial your local CompuServe access number. If you don't know what that is, set your modem for 7 data bits, Even parity, and 1 stop bit and dial (800)848-4480. At the **HOST NAME:** prompt enter **NETWRK**. This will call up the complete list of nodes around the country. Once you've found one in your area, dial it up and at the **HOST NAME:** prompt enter **ATBBS**. When asked to logon to the Ashton-Tate system, simply enter **NEW**.

The board uses Galacticomm's new **X.25** interface. Information files explain that packet is very slow and that is what causes the nearly half second delay in characters appearing on the screen from the point where you pressed a key on the keyboard. Packet is slow. But it isn't THAT slow. We don't know for certain what causes such delay on the Ashton-Tate board but it would

appear NOT to be the CompuServe network and Galacticomm's new **X.25** package, or the **OST X.25** card used with it, have to be prime suspects.

The board itself provides some pretty good information regarding the dBase database program and the Multimate word processor, the two primary products. In fact, we found one file area listing 261 support utilities for dBase III Plus. **ATOD.ARC** converts ASCII fixed field files to dBase format, for example, and **ASM.ARC** contains a text file on using assembly language with dBase. We were of course interested in several files that allowed you to dial a modem from within a dBase application and we'll probably actually use **AV1006.ARC** detailing how to use dBase using Avery brand printing labels.

The message areas are manned by support personnel and you should be able to get an answer to technical questions in pretty short order.

As with most Galacticomm systems, the presentation of file libraries and the means to download were inordinately and unnecessarily clumsy. But the files themselves were very much on topic and provide a wealth of tiny utilities to make life with dBase easier. And we would have to rate a company that provides a totally free BBS to all callers regardless of registration status AND pays their long distance bill to boot as an excellent support company. If this open support BBS is any indication, perhaps Ashton-Tate is on the road to reversing their fortunes.

For those not inclined to deal with the packet delays, A-T maintains a 2400 bps direct dial at (213)324-2188. Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502.

DR. DOBBS - A PROGRAMMER'S TREASURE CHEST

The thrust of the personal computer industry has certainly been directed in recent years towards the business user. To paraphrase John Dillinger "that's where the money is." But a small but loyal market exists among very technical users. Actually, they aren't the users at all but the creators of the tools every-

one else uses. And somehow, in all the hoopla, their status has been relegated to that of nerdish fanatics who have mastered the intricacies of personal computing by dint of an unnatural dedication of twenty hours per day to the task - possible only because of serious and somewhat comical personality flaws.

This is really quite comfortable for the majority of the population. We've essentially stereotyped programmers as wimpish little odd fellows who because of their lack of physical appeal and social graces have no other outlet besides spending day and night at the keyboard - and so of course they have mastered something no well adjusted, handsome individual with a normal life would have time to do. This excuses the rest of us from the insecurities of knowing that there are a number of people who use and understand a tool we don't. This rationalization process has worked pretty well. It's a bit sick - but effective.

In truth, most of the programmer population is pretty normal. If anything, the majority are exceptionally bright, well adjusted, with abnormally high incomes and if anything a penchant for health and fitness activities. We apologize for busting anyone's security bubble.

M&T Publishing publishes a series of magazines devoted to information of interest to this technical elite. They publish *LAN Technology*, *DBMS*, *MIPS*, and *Dr. Dobb's Journal*. Dr. Dobb's is probably the preeminent magazine for serious programmers and caters primarily to the C Language and C++ Language programmer although Pascal and Assembly Language garner pretty good support as well. Published for nearly a decade, Dr. Dobb's has grown from a very homespun newsletter to a very respectable, if specialized, slick magazine. It provides a wealth of programming tips and techniques including some fairly in-depth articles describing specific "how-to" on a variety of programming topics.

Many of the articles are accompanied by printed program source code listings. These can be enormously tedious to key in by hand. Fortunately, M&T has an online service where such listings can be downloaded electronically.

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The M&T PUBLISHING/COMPUTER METRICS LISTING SERVICE operates on a Unix system at (603)882-1599 (8N1). At logon enter "listings" in lower case characters and you'll be allowed to register for this free service. The service is rather plain in presentation - probably a plus with the audience. But it's performance is quick and easy. Best of all, they provide a wealth of online source code listings - particularly for the C programmer.

We found source code for every regular and special issue of Dr. Dobb's for 1988 and 1989. A recent special issue on C listed a string class setup for C++ by Scott Robert Ladd. This "class" allows C++ programmers to manipulate character strings more easily.

The September issue featured a lengthy article complete with source code by Randy Nevins on a program he had developed to aid in laying out printed circuit boards. The listing service provides the ideal medium for downloading both source and executable program for this article.

The service also provides information for other magazines. The *DBMS* publication is primarily devoted to database programming and the same source code listing resource is available there. *MIPS Magazine* is centered on the very high performance 80386 and 80486 PCs. Their section provides source code and executables as well but aimed primarily at Benchmark programs used to compare speed and efficiencies of personal computers. Whetstones and Dhrystones and single and double-precision Livermore Loops are the subject at hand - benchmarks available for download.

Finally, some discussion areas are provided where you can submit article ideas, make suggestions concerning the magazines, and generally hobnob with the creators of some very capable publications on the art of computer programming. M&T Publishing, 501 Galveston Dr., Redwood City, CA 94063; (415)366-3600.

PORLAND JOBS BBS

David Hakala

Ken Zwaschka runs the JOBS_NOW BBS from his executive search firm in Portland, Oregon. The OPUS system is freely available 24 hours a day at (503)281-6808. JOBS_NOW is a welcome addition to the online employment information scene; the West Coast has been virtually unrepresented in our collection until now.

Zwaschka maintains six echomail areas for job offerings, one for posting of resume's and others for caller discussions of employment, consulting and business issues. The job echoes contained 150 current openings when we called, with a healthy sampling from all parts of the West. The resume' area harbored 100 entries, mostly programmers, MIS managers, tech writers and other computer types. Ken updates these areas daily, and deletes listings after 30 days to keep the leads fresh.

JOBS_NOW is strictly for posting of job openings; replies are directed to the JOBS echomail conference, which traditionally has a more eclectic flavor. Zwaschka's dedication to a single theme greatly increases the echo's utility and activity.

The JOBS echo is enjoying a resurrection of sorts thanks to Ken's vigorous and professional participation. JOBS had become a lackluster echo barely worthy of its name. Ken seems to be attracting a serious crew of recruiters, career counselors and employment managers to this national online grapevine. JOBS may now become the resource it was meant to be. Thank you, Mr. Zwaschka!

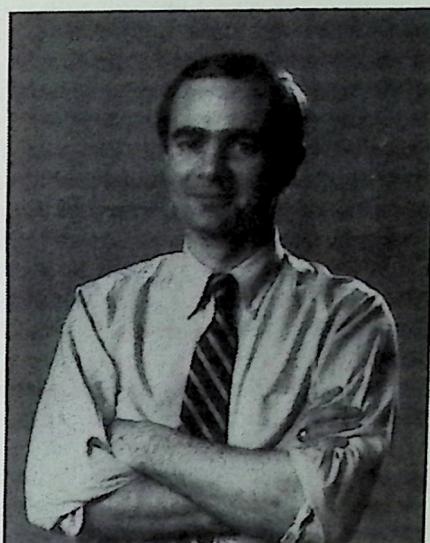
JOBS_NOW is open to any sort of job listing or resume', but Ken's executive search practice is limited to food-processing industry talent. So unless you know how to make Cheeze-Whiz taste like food, Ken probably won't have a job on his desk for you. But the JOBS_NOW BBS is a fine place to make connections in the Northwest.

JOBS_NOW BBS, sponsored by Ken Zwaschka & Assocs.: 618 NW Glisan St., Portland OR 97208. Voice: 503-248-0735, Data: 503-281-6808

GLOSSBRENNER'S CHOICE

PianoMan -- The Best Shareware Music Program

Alfred Glossbrenner



When I was about seven I remember telling my mother that I had two main enemies: afternoon naps and the new rubber spatulas. (This was the 1950's and Rubbermaid had only begun to invade the kitchens of America.) The first took me out of the neighborhood action for too long, and the second did such an efficient job of squeegeeing cake batter from the bowl and beaters that there was precious little to occupy an eager pair of Lickpots and Thimbos.

Even at that age, though, I knew enough not to tempt the gods by revealing the one activity I despised with a passion — practicing the piano. Golly I hated it. And golly I now wish I had practiced longer and harder. If I had, I would not only be able to play with greater skill, I would be able to do so much more with a wonderful shareware program called PianoMan. As it is, I know enough about both software and music to say that this is one incredible piece of programming.

Written by Neil J. Rubenking -- you'll see his byline in PC and other magazines -- **PianoMan** (version 4.01) and its accompanying **PlayerPiano** module, let you create, play back, edit, and convert all kinds of music. And not just the simple-minded da-da-da one-voice tunes IBM PCs and compacts are ostensibly limited to either.

It is true that XTs and ATs are limited to one voice, which means they can only play one note at a time. But with Mr. Rubenking's fugue and harmony style options, you can create a very convincing illusion of polyphony. The author reports that while the package runs successfully on some PS/2 machines, it does not work consistently on that line of computer. Unlike many music programs, **PlayerPiano** 4.x and the tunes it creates automatically sense the speed your processor is running at and adjust accordingly.

If you are not musically inclined, **PianoMan** is not for you. Similarly, if you need to see staves and treble and bass clefs to do your composition or transcription, you will have to look elsewhere. **PianoMan** doesn't work that way. But if you've ever enjoyed plinking around on a piano, whether to amuse yourself, aggravate your family, or to do some serious composing, then **PianoMan** is exactly what you need.

Without wishing to stretch the point, it is about as close to a Casio or Yamaha keyboard as an IBM PC/XT/AT is ever likely to get. Mr. Rubenking asks a shareware registration fee of only \$25, and I think you'll find that **PianoMan** is worth every cent.

Now, let me tell you about the package. Basically, **PianoMan** lets you play the keyboard of an IBM PC/XT/AT like an electronic piano. The keys sound a tone as long as you hold them down, and stop when you release them. You can record and edit music, insert and delete notes, adjust pitch and length, make global changes, and save/retrieve files. Required: A True Compatible

The black-and-white, or "Woody Allen" option, de-colorizes all **PianoMan** and **PlayerPiano** screens. Everything will be white on black, gray on black, or black on white. If you use **PianoMan** with a

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color/graphics adaptor attached to a single-color composite monitor, you may want to invoke this option.

Playing a tune with **PianoMan** is simple. Hit a key once the greeting screen has appeared and you will see a schematic of the keyboard with the notes written on the keytops. When you press a key, the key lights up, and the tone sounds until you release it. Three octaves available at a time, and you can shift those octaves up or down using the up and down arrows. The current octave number shows right between the arrows.

By default, **PianoMan**'s keyboard layout matches that of the standard IBM PC keyboard. If your keyboard has a different layout, a few of the keys may be displaced -- usually the [ESC] and [N] keys. If just those two keys are wrong, the installation program will install the correct keys for you.

The A#, B, and C notes at the right of the lower row are the same notes as those at the left of the upper row. As the on-disk documentation points out, "If the piece you want to play has flats instead of sharps, just remember that in an 'even tempered' scale like **PIANOMAN**'s, one note FLAT is the same as the note below it SHARP." You

can see this immediately if you picture a standard piano keyboard -- the key you hit for B-flat is the same key you hit for A-sharp.

A legato mode is also available. When you hit [SCROLL LOCK], you toggle on legato. From that point on, until you hit [SCROLL LOCK] again, each time you hit a note the tone will sound until you hit another note. Otherwise, notes stop as soon as you release the key.

That's the basic setup. But it would be no more intriguing than a child's keyboard were it not for the other features. Specifically, the option to *record* the notes you play. "Record" mode is toggled on and off by hitting the [HOME] key. You can thus work out a passage, record it, turn recording off, work out a second passage, record it, and so on. The PC stores all of your notes (up to a maximum of 63,488) in memory.

To play back the passages stored in memory at any time, you hit your [INS] key. To clear out the memory, hit [DEL]. Hitting [F2] saves a tune to disk, while [F3] loads a previously recorded file.

Editing Your Work

Perhaps most remarkable of all, once a tune is in memory, PianoMan lets you edit it almost as if you were editing a text file with a word processor. The tune to be edited can be either a sequence of notes you have keyed in with the "record" mode enabled or notes you have saved to disk as a file.

Either way, once you press [F1], you will see a screen from which you can change individual notes, blocks of notes, or the entire tune. You can insert and delete notes, adjust pitch and length, make global changes, and save/retrieve files. You can even mark blocks of notes to delete, copy, or move.

Sixty notes at a time show on the screen, with the note, octave, duration, and "staccato value" shown. Each note has its own box. The note can be found in the upper left corner of the box. The number in the upper right corner is its octave. The number in the lower right corner is its duration in milliseconds. And the number in the lower left corner is its staccato value.

The note/box the program is currently focusing on will always be highlighted. You move from note to note with your cursor keys. There are no menus, and every command is always available. In general, plain unshifted keys control single-note commands. For example, [T] makes the current note a triplet. [S] makes it a sixteenth. The actual time values use the quarter note as their reference point, and you can set the quarter note value with the installation program.

When you make a change of any sort, the new note you have created sounds so you can hear what you have done. And of course you can toggle back to the main screen to play whatever is in memory at any time by hitting [ESC].

Other Nifty Commands

Mr. Rubenking has made it exceptionally easy to move around a tune. In addition to the keypad keys, you can also add markers to the file and zip instantly from one to another. To add a marker, hit [Alt][A] and designate it numerically 0-9.

There are also two commands specifically designed to facilitate the illusion of polyphony mentioned earlier. As noted, the PlayerPiano module has the ability to create this illusion by rapidly alternating between notes. Only one note is played at a time, just as only one movie frame is shown at a time. But by rapidly alternating notes, it *sounds* as though more than one note is being played at a time.

To create a single file that will sound like several voices when it is played, you must first create a file for each voice. You may have anywhere from 2 to 4 voices. The next step is to merge the voices into a single file with PlayerPiano. There are two merge options: fugue and harmony.

If you choose fugue, every note must be the same length and each voice file must contain the same number of notes. If you choose harmony, the voices must be of identical time length, but the individual notes don't have to be. Instead, there must be a greatest common divisor for all the lengths of the notes in all the voice files. The greatest common divisor is the largest number that divides evenly into the length of every note in the tune.

Now obviously, none of this would be much fun to do by eyeball, ear, and hand. Thus Mr. Rubenking has provided two tools in PlayerPiano. The first is the [Alt][J] join command. Designed to be used on a file created by the merging process, this command will identify every instance of two identical notes sitting side-by-side and merge them into one.

The second is the [Alt][X] examine command. This causes the program to analyze the tune and report the greatest common divisor. It also reports the total time length of the tune. This information may be required by PlayerPiano when you merge several voices under the harmony option.

The PlayerPiano Program

I've been referring to PlayerPiano as a module, but it is actually a separate program supplied with the PianoMan package. The program is designed to do two major things. It converts the .MUZ files created by PianoMan into .EXE files

you can run separately as a stand alone program from the DOS command line without benefit of PianoMan itself. It can also be used to convert those .EXE files back to .MUZ format for further editing.

As Neil Rubenking points out in his documentation, "It's possible to use a tune that stops with a keystroke as a kind of timed 'wait' statement in a batch file. The tune will play, catching the user's attention, and the batch file will continue either when the user presses a key or when the tune ends." You can also convert a .MUZ file into a Super-Key macro file that takes advantage of that program's "beep" function.

As Mr. Rubenking points out in his documentation file, there are many ways to incorporate PianoMan tunes in the programs you write. If you are using an all-purpose language like Pascal, BASIC, or C, you can simply read the MUZ file and play the tune directly. A Turbo Pascal 4.0 example is included on the PianoMan distribution disk.

PianoMan and PlayerPiano are widely available from the normal public domain/shareware sources. Often you'll find them, along with the 15-page documentation file and the installation program distributed as a single archive. If you like, however, I've assembled a disk that contains not only that main file, but Chris Dunford's SPKR.SYS device driver as well. Plus scores (no pun intended) of songs programmed by Mr. Rubenking and others (everything from Bach to the Beatles, with Scott Joplin, Mozart, and Tom Lehrer for good measure). Ask Music Disk 1 (\$5 for 5.25- inch floppy; \$6 for 3.5-inch media). You can reach me at FireCrystal Communications, 699 River Road, Yardley, PA 19067.

[Alfred Glossbrenner is the author of *Alfred Glossbrenner's Master Guide to Free Software for IBMs and Compatibles, The Complete Handbook of Personal Computer Communications--3rd edition (1990)*, *How to Look It Up Online*, and many other books. He can be reached on CompuServe at 70065,745 and on MCI Mail at AGLOSSBRENNER.]

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Society for Technical Comm. BBS	(202)393-3515	STC Job Service, Freelance Registry - Technical Writers	Society for Technical Communication	Washington ,D.C.
Sound Advice BBS	(816)436-4516	Twenty Line PCBoard with 2 Gigabytes Storage - HST Modems	Roy Timberman	Gladstone ,MO
State and Local Emergency Mgmt.	(202)646-2887	Hazardous Materials/National Dam Watch/Emergency Info	Federal Emergency Management Agency	Washington ,D.C.
Synergy	(617)769-5488	Turbo Basic/Turbo C/Quick C/Turbo Pascal/Assembly Language	Gerry Powers/Jim Boxtmeyer	Norwood ,MA
Take 3 BBS	(602)482-1001	Reviews of Movies/Videos/ Film Industry Job Clearinghouse	Dave Kidder	Scottsdale ,AZ
Talk Channel	(818)506-0620	DLX-Based Multiline Chat/Talk Service - Sexual Orientation	Gary Clarkson	North Hollywood ,CA
TAXACOM	(716)896-7581	Botany, Herbaria, FLORA ONLINE Newsletter, Latin Translation	Clinton Herbarium, Buffalo Museum	Buffalo ,NY
Taxonomic Reference File	(215)972-6759	Online Bacterial Name Database - ORACLE Door	BIOSIS Carol Lock/Keith Pittman	Philadelphia ,PA
TBBS Net 104/23	(303)699-9248	Home of The Bread Board System (TBBS) BBS Software	Phil Becker/eSoft Inc.	Aurora ,CO
Techntronics	(212)924-6899	LAN/PC Support and Technical Information	Chris Weilber	New York ,NY
Telegodzilla	(503)621-3746	Home of ZModem File Transfer Protocol/YModem/YAM	Chuck Forsberg/Omen Technology Incorp.	Portland ,OR
Telix Support BBS	(416)439-8293	Support Service for Telix Communications Software	Colin Sampaleanu/Exis Incorporated	West Hill ,Ontario
Texas State Law Library BBS	(512)463-1371	Online Legal Periodicals and Citation Database	Jim Appleby	San Antonio ,TX
The Business BBS	(213)477-0408	Microsoft Windows Support	Joseph Sheppard	Los Angeles ,CA
The Ledge PCBoard	(818)352-3620	Home of Textview Door for PCBoard Systems	Richard Paquette	Tujunga ,CA
The LiveWire BBS	(609)235-5297	Online Magazine Subscription Orders	Tim McCormick and John Everman	Mt. Laurel ,NJ
The Unique and Nifty BBS	(317)866-0725	Computer Graphics, Animation, and Sound Files	Whole Earth Electronic Link	Crawfordsville ,IN
The Well	(415)332-1910	Unix Conferencing System - \$8 monthly plus \$3 hourly	Phil Thomas/Thomas Business Systems	Sausalito ,CA
Thomas Business Systems	(407)395-7057	Used Computer/Peripheral Price List Online Database	Sun Microsystems	Boca Raton ,FL
TOPS Support BBS	(415)769-8874	Application Notes, Product Descriptions for TOPS LAN	Chips@t Inc.	Alameda ,CA
Turbo Tax Support BBS	(619)453-5232	Income tax information - Turbotax 10-0 program support	U.S. Robotics Corporation	San Diego ,CA
U.S. Robotics - Sit IUBU Sit	(708)982-5092	Support for US Robotics HST 9600 bps Modems	Dr. James Waldron	Skokie ,IL
United Nation's BBS	(201)795-0733	UN Press Releases - Unitek News - Unicef	US Department of Commerce US Naval Observ	Hoboken ,NJ
US Naval Observatory BBS	(202)653-1079	Time - Date - Sunrise - Sunset - Enter @TCO for Commands	Boardwatch Magazine	Washington ,D.C.
USA Today Distribution Service	(303)973-4222	Distribution Service for USA Today/Newsbytes/Boardwatch	Council on USA/German Democratic Repub.	Littleton ,CO
USA/GDR Database	(202)529-0140	News from East Germany, Rumania, USSR, Czechoslovakia	US Geological Survey Earthquake Info Cnt	Washington ,D.C.
USGS Quick Epicenter Determin.	(202)653-0351	Earthquake Epicenter Data - Geomagnetism/E2	Denver ,CO	Denver ,CO
USNO Time of Day for Clocks	(512)471-9420	Xmtis ASCII Time String - Sync Your PC to USNO Atomic Clock	US Dept. of Commerce US Naval Observ.	Washington ,D.C.
UT Library Online Catalog	(602)640-2371	Online Library Card Catalog Listing 3.5 million entries	University of Texas at Austin	Austin ,TX
VA Property Listing BBS	(407)839-0333	List of VA held property foreclosures	Veterans Admin - Phoenix Regional Office	Phoenix ,AZ
Vacation Florida Database	(604)734-3282	Florida Tourism Information/Database of Campsites/Hotels	Richard and Barbara Kanney	Orlando ,FL
Vancouver ED-NET	(312)545-8086	Educational Online Service	Vancouver Board of Education	Vancouver ,BC
Ward and Randy's CBBS	(800)827-2727	World's First and Oldest Micro-based BBS - Since 2/16/78	Ward Christensen/Flandy Suess	Chicago ,IL
WeatherBank	(612)296-5426	Online Weather Forecasts for Any City - Download Radar Data	Steve Root/WeatherBrief Data Services	Salt Lake City ,UT
WeatherStar Pilot Briefing	(714)756-8176	Pilot Data, Weather, Great Circle Route, Airport Information	Haynes Environmental Systems	Minneapolis ,MN
Western Digital Tech Support	(508)667-5669	Hard Drive/Controller Installation and Config Data	Western Digital Corporation	Billerica ,MA
XyQuest Support BBS	(713)520-1569	Support for XyWrite Word Processor - Custom Keyboard Files	XyQuest Inc. - Christine Madsen	Houston ,TX
Ye Olde Bailey		Legal Issues Regarding RBOC Relations with Info Services	Reginald Hirsch; Attorney	

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LIST OF AREA CODE 303 ELECTRONIC BULLETIN BOARD SYSTEMS AND ON-LINE INFORMATION SERVICES - MARCH 1990

TITLE	PHONE	DESCRIPTION	TYPE	MODEM	SOFT	CITY	OPERATOR
Adelante 104/93	443-8292	Central/Latin America News/Issues	IBM	2400	Opus	Boulder	Zahal Stewart
APSNet	693-6737	Aurora Public Schools Network	Apple	2400	GBBS	Aurora	Columbia Middle School
Arvada 68K BBS	424-9831	Amiga/Macintosh/Atari ST/Motorola 68000	Amiga	2400	BBS-PC	Denver	Reid Bishop
Boardwatch Magazine 104/535	973-4222	Back Issue Index, Dialing Directories	IBM	2400	TBBS	Littleton	Jack Rickard
Boulder Amiga Users Group	494-4470	Amiga Support - Over 1000 Amiga Files	IBM	2400	QuickBBS	Boulder	Ken Fricklas
Byte Shop 104/311	794-5065	Jokes/Good Echomail/Downloads	IBM	96HST	QuickBBS	Littleton	Dan O'Neal
C.A.C.H.E	745-4960	CO Apple & Compatible Home Enthusiasts	Apple	2400	GBBS	Denver	Gary Edwards
C.A.R.L. Denver	830-1546	Colorado Alliance of Research Libraries	Tandem	1200	Custom	Denver	N/A
C.D. Players	825-0419	Colorado Alliance of Research Libraries	Tandem	2400	Custom	Denver	N/A
Chatfield Armory	972-9023	Computer Discount On-line Store/Amiga	Amiga	2400	TBBS	Denver	Jay Tompkins
Cheyenne Social Club	423-4710	Firearms for Sale/Trade - Online Games	IBM	2400	QuickBBS	Littleton	Dave Bell
Childvillas 104/207	449-7399	140 Relaynet Conferences - Downloads	IBM	2400	PCBoard	Denver	Jay Elewitz
CMOS-CO Mtn Operating Systems	322-4078	Bhagwan Shree Raineeesh followers	IBM	96PEP	Opus	Louisville	Terry Mooster
CO State Judicial BBS 104/420	831-1704	Amiga/IBM-Utilities-Pictures-Buy/Sell	IBM	96V32	QuickBBS	Denver	Kevin Truitt
Comm-Post, The 104/666	534-4646	Colorado State Judicial ADP Department	IBM	2400	QuickBBS	Denver	Scott V. Hopka
Computer Consulting 104/318	973-1002	Astronomy - 120+MB of Files - Multiline	IBM	96HSTV32	TBBS	Littleton	Brian Barrie
Control Systems 104/417	458-6248	dBase Database Software Development	IBM	96Hayes	QuickBBS	Littleton	Jim Bucks
CP/M SIG INC 104/372	465-1313	IBM/Compatibles Subscription Board	IBM	96MICROC	RBBS	Broomfield	Lupe Ramiriz
Crypt, The	696-9084	Oldest User's Group in Area - CP/M - IBM	IBM	2400	Fido	Littleton	Al Lundequist
D-Link 1 104/411	936-2791	Twenty Online Games - Adult Messages	IBM	2400	WWIV	Denver	Bill Bonic
Dark Crystal, The 104/421	654-1278	Golden Micro Computer Sales/Support	IBM	96HST	QuickBBS	Denver	Bob Wells
Dementia	986-9610	Role Playing Games	IBM	2400	QuickBBS	Denver	Steve Boyd
Denver Area R:BASE Users Group	422-2149	American MENSA Denver Chapter	Apple	96HST	GBBS	Lakewood	Chuck Peito
Denver Computer Investor BBS	440-4128	R:BASE Information PC Related Files	IBM	2400	QuickBBS	Lakewood	Paul Fullerton
Denver Deaf-Net	989-9245	Financially Oriented	IBM	1200	RBBS	Littleton	Hugh Casey
Dinosaur Board 104/114	1-652-3595	Hearing Impaired/Computing	IBM	2400	QuickBBS	Lakewood	David Shneneman
Dragonfriends Place 104/11	782-9547	TRS80 Support/16 Online Adventure Games	IBM	96HSTV32	TBBS	Niwot	Chris Anderson
Eagle's Nest 104/315	933-0701	Wicca/Astrology/Tarot/Pagan Interests	IBM	2400	Opus	Denver	Russ Anderson
Emerald City BBS 104/214	427-1471	Many Files and Echoes	IBM	9600	QuickBBS	Littleton	Ronald Olsen
EMPLOY-NET	871-9504	Electronics Discount World	IBM	2400	QuickBBS	Westminster	Daniel Osborn
Enterprise	377-1005	Employment Info.. Career Management	IBM	2400	QuickBBS	Denver	David Hakala
eSoft TIBS Software Support	699-9248	Local Radio Freq List - Star Trek Theme	Apple	2400	Protress	Denver	Jeff Tensly
Fantasy Mtn D-Link IV 104/803	278-8369	The Bread Board System-LOGON:ANSI DEMO	IBM	96HST	TBBS	Aurora	Phil Becker
Four Wheeling BBS, The	469-4954	Deaf and Handicapped Issues ASCII TTY	IBM	2400	QuickBBS	Golden	Steve Shockley
Fred's BBS	233-1316	Atari	Atari	2400	Stadel	Broomfield	John Ferguson
Free Information Exch. 104/89	699-1516	Over 1300 Adult Files	IBM	2400	QuickBBS	Lakewood	Fred Schupner
Free Thought BBS 104/423	695-0654	Programming - Home and Garden	IBM	2400	Opus	Denver	Charles Frinka
Front Range BBS 104/213	466-2296	Objectivism/Liberarian-IBM/Amiga Files	IBM	96HSTV32	QuickBBS	Aurora	Bill Williams
Front Range PC Users Group BBS	1-493-4094	Front Range Software Services	IBM	2400	QuickBBS	Littleton	Gary Jones
Grotto, The	694-9050	Fort Collins Group - Computer Express	IBM	2400	QuickBBS	Wildecat	Tom Oppenheimer
FutureWave BBS 104/57	440-7425	Games / C Language / MIDI	IBM	2400	Opus	Boulder	Bruce Arnold
Galaxy Express 999 104/215	469-3221	Japanese Cartoon Animation-Messages	IBM	2400	QuickBBS	Broomfield	Withheld by Request
Gay Community Fido 104/19	795-1215	Messages / Downloads for Homosexuals	IBM	1200	QuickBBS	Littleton	Tom Gettys
GDP Technologies BBS	673-9470	Outstanding IBM Shareware/Programming	IBM	2400	QuickBBS	Wildecat	Vincent Veritas
Grotto, The	694-9050	Amiga, Pascal - Ebert Personal Computers	IBM	2400	TBBS	Aurora	Mark Willecke
HP Haven 104/312	671-5976	Tradewars/On-line Games/ 5PM:7:30 AM	IBM	96HST	QuickBBS	Westminster	Clemith Houston
Intelligence Connection, The	373-9581	Artificial Intelligence/Natural Language	IBM	2400	QuickBBS	Golden	Ron Dries
JEFFCOM BBS	273-6951	Jefferson County Public Schools	IBM	1200	RBBS	Boulder	Jim Burt
King's Market Bookshop 104/115	665-6091	Books, Writers, On-line Adventure Games	IBM	2400	TBBS	Denver	Ralph Allison
Kings Bench 104/615	377-6725	Compatible Computer, Info Exchange	IBM	2400	Fido		

L&L Support	420-3568	Primary GBBS Pro Software Support BBS	Apple	2400	Avada	Lance Taylor-Warren
Lakewood Department of Safety	987-7388	Police Sponsored - Law Enforcement Msgs	IBM	1200	RBBS	Wheatridge
LaserWriting Desktop Service	741-4122	Laser Printing/Scanning/linotronic 300	MAC	1200	RedRyder	Denver
Lensman, The	979-8953	Science Fiction/Fantasy Fandom News/Info	IBM	2400	GT Power	Littleton
LES-COM-net	526-2046	Lesley College Comm Net - GBBS Multilne	Apple	2400	GBBS	Genesee
Lodge, The 104/212	420-0305	Arvada Quick BBS Board	IBM	2400	QuickBBS	Arvada
MACE 104/416	797-8090	Metro Area Computer Enthusiasts	IBM	2400	QuickBBS	Denver
Med-Link Colorado 104/444	499-1022	Medical Files and Information	IBM	2400	Opus	Boulder
MICRO	752-2943	Mile High Computer Resource Organization	IBM	2400	QuickBBS	Westminster
MicroLink B 104/108	972-9600	1 Gigabyte Files - USA Today - Multilne	IBM	2400	QuickBBS	Littleton
MicroLink D 104/711	237-8575	Over 200 MB - Doesn't Break	IBM	96HSTV32	TBBS	Lakewood
MicroLink Minus Two 104/204	753-9710	Professional Comp. Sales Inc./Astronomy	IBM	2400	TBBS	Littleton
Midrash 104/18	289-6864	Messianic Judaism - Religious/Philosophy	IBM	2400	QuickBBS	Denver
Mile High BBS	733-1340	Triathalons - Race Schedules - Fitness	IBM	2400	RBBS	Denver
Mile High Mac Meet	758-9159	Denver Macintosh Users Group	MAC	96HST	WWV	Denver
Mile High Net	671-7308	Fido Board	IBM	2400	Fido	Aurora
Monkey Boy BBS 104/43	469-7161	Smileware Software	IBM	2400	Opus	Broomfield
NBS Automated Computer Time	494-4775	ACTS - Sync PC Clock to NBS Atomic Clock	Custom	1200	Custom	Boulder
NetComm BBS	790-8349	Weather - Online Games - 110 MB	IBM	2400	GT Power	Littleton
New Age Bulletin Board, The	366-1106	Health, Ecology, Philosophy	IBM	1200	TBBS	Aurora
NightFlyer 104/210	467-9199	Basicl/Base/Assembler/C Programming	IBM	2400	QuickBBS	Arvada
Ninth Portal, The	690-5001	SciFi/Fantasy Starship Exploration Game	Amiga	2400	Atredes	Boulder
OKY BBS 104/13	494-0533	Armenian Electronics Consultant	IBM	2400	QuickBBS	Estes Park
On-Line Consulting 104/45	449-5251	Consultant Directory/Desktop Publishing	IBM	2400	Opus	Chairman
On-Line Shopping Service	442-5125	Boulder Home Grocery Delivery \$5 +5%	IBM	1200	Boulder	Boulder
PC11 104/904	789-4610	PC Info Services - List of User Groups	IBM	2400	Opus	Englewood
Pentax Support	460-1637	CD WORM/Flatbed Scanner/Fanfold Laser	IBM	1200	Opus	Broomfield
Pinecific 104/28	444-7073	170 Meg - Online Order for CDB Systems	IBM	96HST	Opus	Boulder
Priority Business Sys. 104/41	771-8107	PC Magazine/Tech Journal Files	IBM	2400	Opus	Littleton
Professional System, The	740-2223	Writers, Lawyers, EDPAuditors	IBM	1200	TBBS	Littleton
Quick Epicenter Determination	279-6374	USGS Earthquake Data 7E2	VAX	300 7E2	?????	?????
R.A.B.I.T.	757-5059	Colorado Highway Department - Planning	IBM	1200	TBBS	Denver
Ready Room, The 104/424	329-8136	Star Trek Theme - USS Tutakai NCC-1799-B	IBM	2400	QuickBBS	Denver
Realtime Control & Forth Board	278-0364	Vesta Technology/Denver Forth Int. Group	IBM	2400	PCBoard	Wheatridge
Regency Datasource 104/58	972-1222	Private Computer Consulting Support	IBM	96Hayes	Opus	Littleton
Rocky Mtn Info Exch 104/739	841-9570	Multilne - INFOMAT - Chat areas - Games	IBM	96HSTV32	TBBS	Parker
Ron and Shannons BBS	978-0298	Atari Support 5.4 MB XE 130	Atari	2400	OASIS	Englewood
Short Line 104/36	778-7312	Varied Topics, Fidonet, Binkley/Term	IBM	96HSTV32	TBBS	Denver
SnarfQuest V 104/317	973-0625	The Tower	IBM	2400	QuickBBS	Littleton
SnarfQuest II 104/46	761-1634	The Arena On-line Games, Fantasy, AD&D	IBM	96HST	TBBS	Aurora
Sound Doctrine BBS 104/514	680-7209	Christian BBS / Sound Doctrine Church	IBM	2400	QuickBBS	Boulder
Space Environment Service Cntr	497-5000	NOAA Solar Flare Forecast / Advisory	IBM	1200	PBBS	Boulder
Space Network	494-8446	Space Exploration Information	IBM	2400	TBBS	Boulder
Steamboat Information	1-879-6741	Info on Steamboat Springs Area	IBM	1200	TBBS	Steamboat Springs
Stonewall 104/112	499-2876	Online Games/Graphics 120 MB	IBM	96HST	QuickBBS	Boulder
TBBS Net 104/23	699-9248	The B)read Board System Support	IBM	2400	TBBS	Aurora
The 8th Sea 104/610	252-9235	Fidonet 104 Net Coordinator	IBM	2400	QuickBBS	Northglenn
The Oak Tree	431-7522	A meeting/conversation place for women.	IBM	1200	RBBS-PC	Arvada
Translations Unlimited	988-5765	Language Translation 6PM-6AM	IBM	2400	MinHost	Lakewood
Trekker World	671-9051	Star Trek Fanzine	Apple	2400	GBSPro	Denver
Vet Set, The	690-3218	Veterans Issues	IBM	2400	GAP	Aurora
Watchdesk, The 104/66	450-0892	Safety - Arson - Hazardous Material	IBM	96HST	QuickBBS	Thornton
Wizar, The 104/211	429-2975	Good Collection of Game Software	IBM	96HST	Opus	Westminster
Wizardy 104/630	670-1416	Fantastic Online Blackjack/Casino Games	IBM	96HST	QuickBBS	Evergreen
World Peace BBS 104/415	320-4822	Current Events, Politics, Religion	IBM	2400	QuickBBS	Denver

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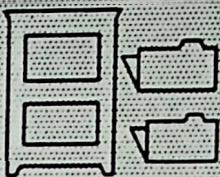
Name you will use for BBS Logon:

First _____ Last _____

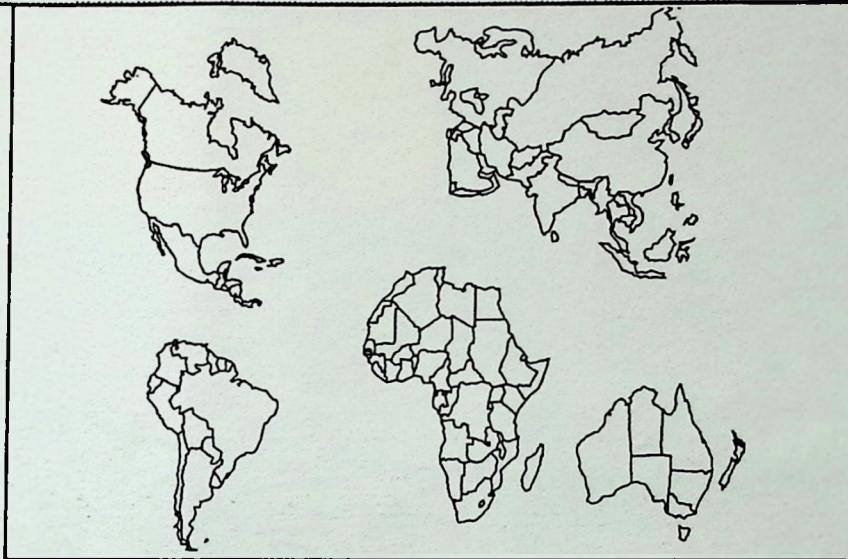
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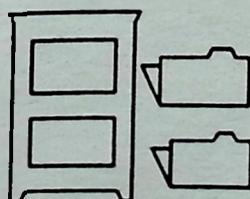
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